# Basic Terrestrial Flora and Fauna Assessment

Stage 1 Works – Nightcap Village
2984 Kyogle Road, Kunghur | Lot 11 on DP1194471

Prepared for NCV Enterprises Pty Ltd
By Planit Consulting Pty Ltd

**February 2020**

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### Project Details

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|---|---|
| **Project Name** | **Stage 1 Works** |
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| **Planit Reference** | **J6100** |

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*Appendix 1 – Proposal Plans*
*Appendix 2 – NSW Bionet Database Records (2019)*
*Appendix 3 – BOSET Report Prepared for the Site*

# 1 INTRODUCTION

Planit Consulting Pty Ltd has been engaged by NCV Enterprises Pty Ltd (the applicant) to prepare a Basic Terrestrial Flora and Fauna Assessment document for Stage 1 works regarding the proposed Nightcap Village. The site is located at 2984 Kyogle Road, Kunghur and is legally described as Lot 11 on DP1194471

This report outlines the results of flora and fauna investigations and describes vegetation types, habitat associations and ecological values of the proposed development envelope and surrounding areas.

# 2 SITE DESCRIPTION & LOCATION

## 2.1 Site Description

The proposed Stage 1 works is located on Lot 11 DP1194471 at 2984 Kyogle Road, Kunghur (**Figure 1**). The site is irregular in shape and is bordered large rural properties in all directions. Kyogle Road traverses the proposed works area.

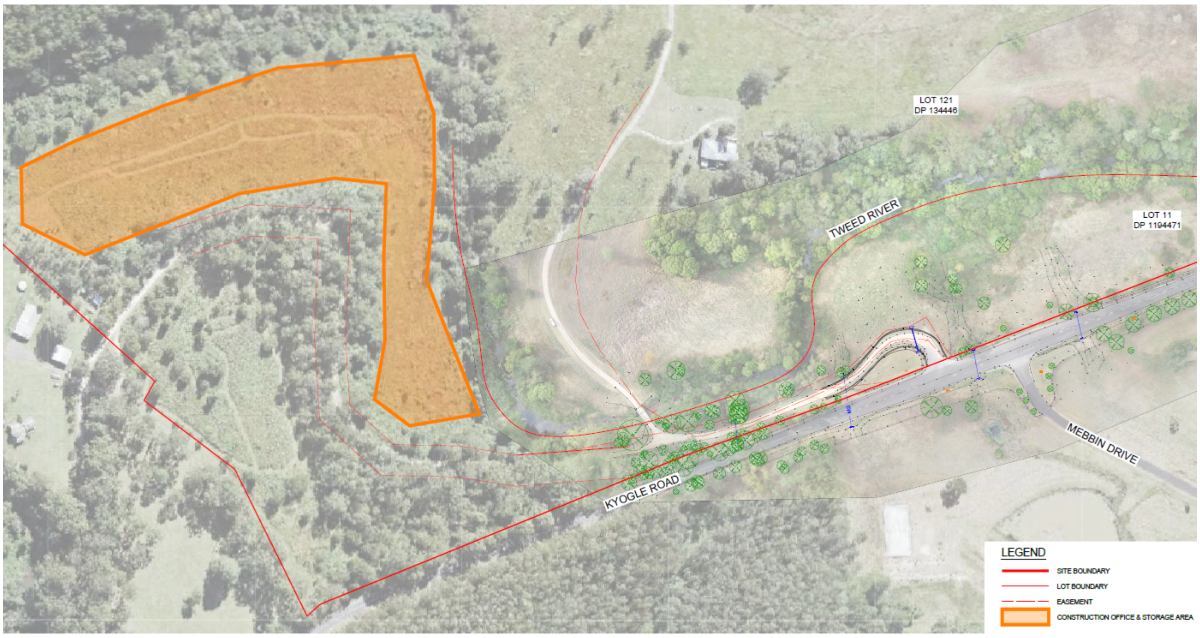


**Figure 1: Stage 1 - Works**

Given its significant size in comparison to the proposal footprint, it is considered not practical to survey the entire allotment (Lot 11 DP1194471). The site has been broken down into a 'Study Area' (refer to **Figure 2**) which downsizes the survey area and focuses upon the areas surrounding the works footprint. The Study Area incorporated the works footprint with a buffer of ~10m.

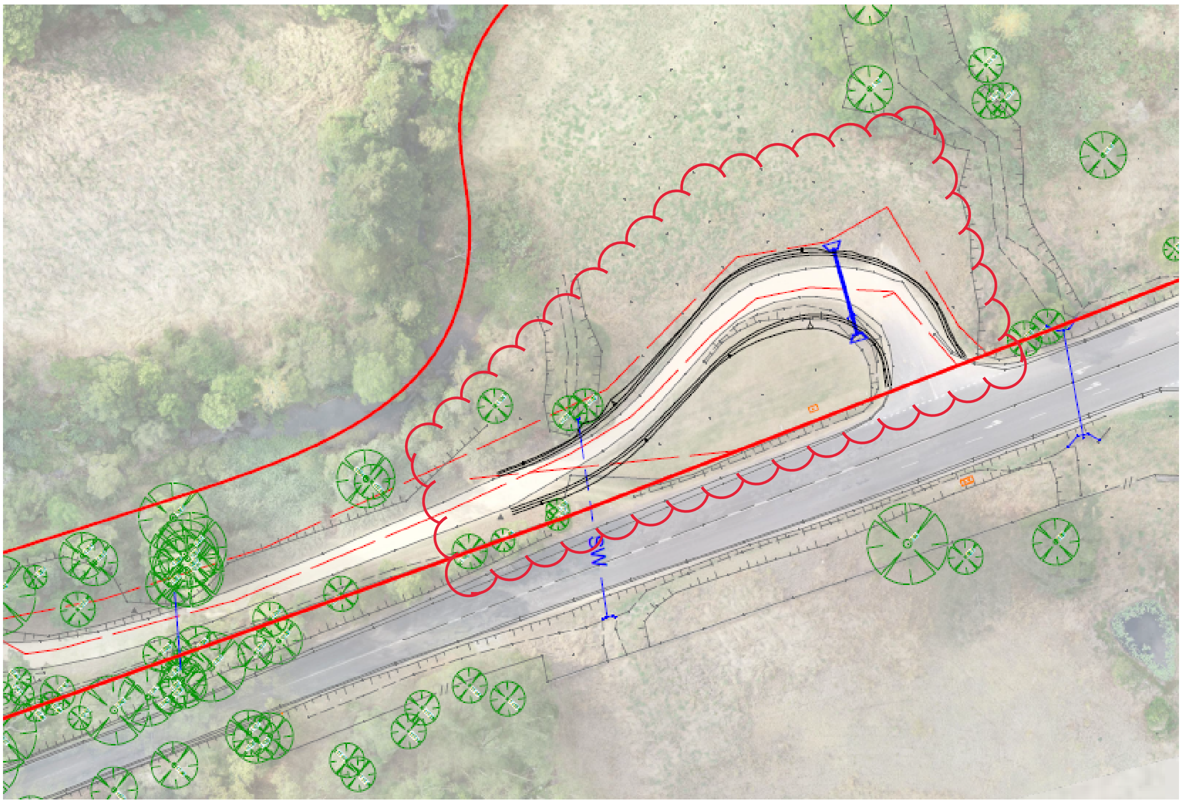


**Figure 2: Approximate Onsite Study Area (Red Cloud)**

## 2.2 Existing Use and Resultant Vegetation

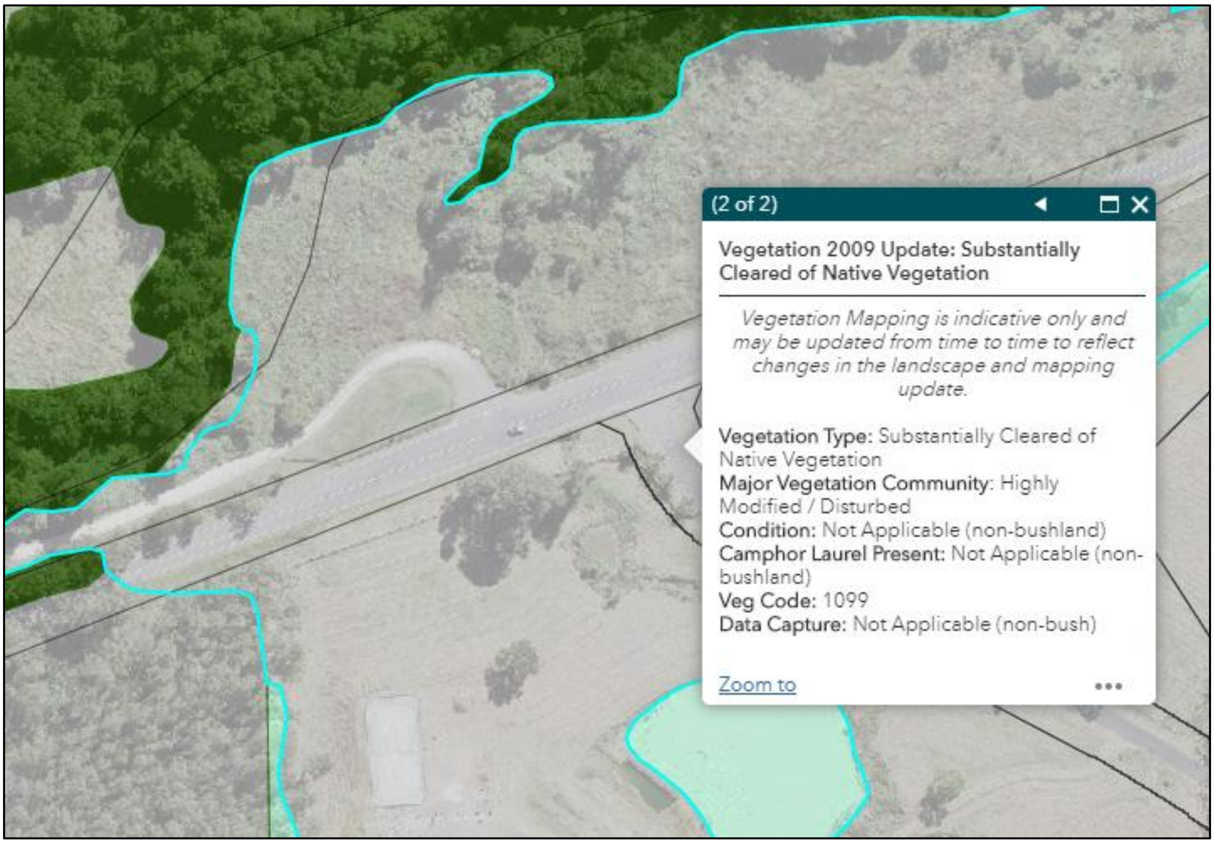
The majority of the works areas comprises of Kyogle Road and the existing site access to Nightcap Village.

The remaining areas of the works footprint is vacant land, which was historically cleared likely for agricultural/farming purposes, similarly to the surrounding rural allotments.

Existing structures on the site include:

- Existing roadways;
- Culverts;
- Fencing;
- Stormwater devices;
- Signage;
- Turfed areas;
- Landscape plantings.

The Tweed Shire Vegetation Mapping (refer to **Figure 3**) notes that the works footprint is mapped as 'Substantially Cleared of Native Vegetation'. This was ground-truthed to be largely accurate given the highly disturbed nature of the area (further details provided within **Section 3**). The very southwest portion of the Study Area contained Flooded Gum plantation.



Vegetation 2009 Update: Substantially Cleared of Native Vegetation

*Vegetation Mapping is indicative only and may be updated from time to time to reflect changes in the landscape and mapping update.*

**Vegetation Type:** Substantially Cleared of Native Vegetation
**Major Vegetation Community:** Highly Modified / Disturbed
**Condition:** Not Applicable (non-bushland)
**Camphor Laurel Present:** Not Applicable (non-bushland)
**Veg Code:** 1099
**Data Capture:** Not Applicable (non-bush)

**Figure 3: Tweed Shire Vegetation Mapping (Source: TSC, 2009)**

## 2.3 Project Description

Stage 1 works involves private road works and associated earthworks to formalise primary site access from Nightcap Village to Kyogle Road (opposite Mebbin Drive). The proposal plans are provided within **Figure 4** and **Attachment 1**.

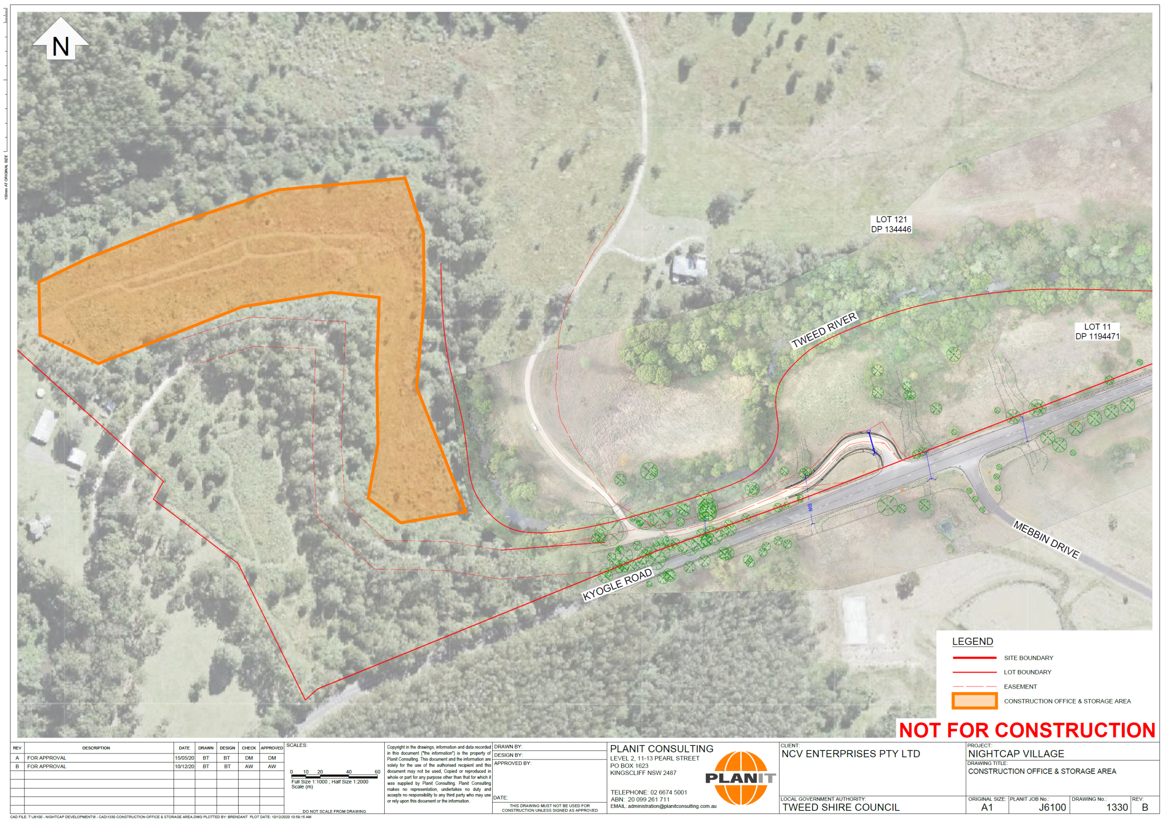

N
LOT 121
DP 134446
TWEED RIVER
LOT 11
DP 1194471
MEBBIN DRIVE
KYOGLE ROAD
LEGEND
SITE BOUNDARY
LOT BOUNDARY
EASEMENT
CONSTRUCTION OFFICE & STORAGE AREA
NOT FOR CONSTRUCTION
A FOR APPROVAL 15/05/20
B FOR APPROVAL 10/12/20
PLANIT CONSULTING
LEVEL 2, 11-13 PEARL STREET
PO BOX 1623
KINGSCLIFF NSW 2487
TELEPHONE: 02 6674 5001
ABN: 20 099 261 711
CLIENT: NCV ENTERPRISES PTY LTD
PROJECT: NIGHTCAP VILLAGE
DRAWING TITLE: CONSTRUCTION OFFICE & STORAGE AREA
LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL
ORIGINAL SIZE: A1
PLANIT JOB No: J6100
DRAWING No: 1330
REV: B

**Figure 4: Proposal Plan**

## 2.4 Geology

As illustrated within the eSPADE geology mapping extract (**Figure 5**), the site contains one soil landscape type, described as below:

- Kunghur (9541ku)

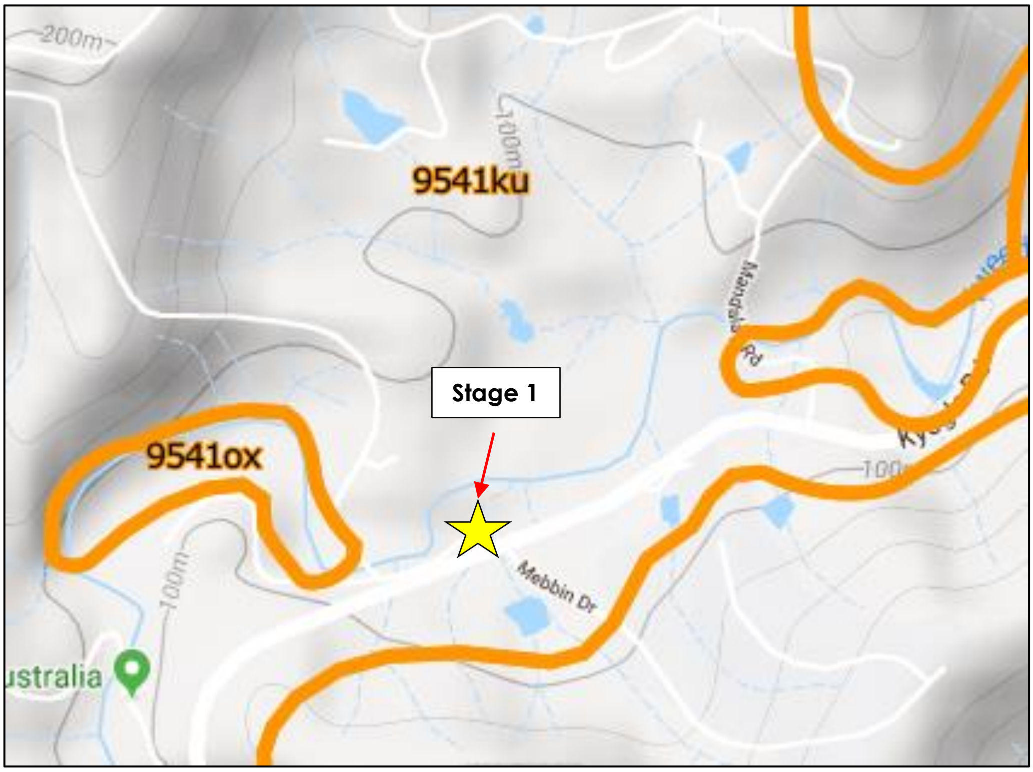


**Figure 5: eSPADE Geology Mapping Extract (Source: eSPADE Mapping, 2019)**

Such areas are described in detail within Morland, 1994:

- Kunghur (9541ku): Mapped over the entire Stage 1 works footprint.

Location: Moderately inclined hills on Bundamba Group sediments within the Tweed Caldera. Occurs predominantly on the south of the sheet in the Kunghur area, but is also present near Numinbah and Chillingham. Type location is the hills to the south of Kunghur.
Landscape: Undulating and rolling hills on Bundamba Group sediments. Relief is 100–150 m and slopes are 5–30%. Elevation is 100–300 m. Ridges are narrow (50–100 m) and have common rock outcrop. Partially (in places extensively) cleared tall openforest (wet sclerophyll, some dry sclerophyll).
Geology: Bundamba Group (Triassic–Jurassic)—sandstone, siltstone, claystone, conglomerate.
Topography: Undulating and rolling hills. Relief is 100–150 m and slopes are 5–30%. Elevation is 100–300 m. Slopes are long (500–800 m) and waning. Ridges are generally convex and narrow (50–100 m), though in many instances ridge tops form moderately broad (250–300 m), level crests. Rock outcrop is common along ridges and upper slopes. These usually form discontinuous sandstone cliffs, 10–20 m high, flanked by fallen blocks and boulders. Drainage is erosional, tributary and integrated. Streams generally occupy V-shaped valleys.

## 2.5 Aims of Study

The aim of this report is to describe the terrestrial flora and fauna habitat of the Study Area and adjoining areas and to examine the potential for the occurrence of threatened species, populations, their habitats or endangered ecological communities. In order to provide this information, the following specific objectives are to:

- Determine and describe the existing flora, vegetation communities, fauna assemblage and associated habitats of the Study Area and adjoining areas,

- Determine the occurrence, or likely occurrence, threatened species, populations, their habitats or endangered ecological communities as a result of detailed survey and literature review,
- Undertake the 'test of significance' pursuant to Section 7.3 of the *Biodiversity Conservation Act 2016*,
- Undertake SEPP 44 (Koala Habitat Protection) assessment,
- Describe the potential direct and indirect impacts of the proposal on existing terrestrial ecological values,
- Propose amelioration measures to avoid, manage or mitigate potential impacts upon the ecological values of the Study Area.

## 2.6 Definitions, Terminology & Nomenclature

For the purposes of this flora and fauna assessment the following definitions apply:

*Works Envelope/Development Footprint/Proposal Footprint*: refers to those areas of the site which will be occupied by the works footprint (as depicted within **Figure 1 and Attachment 1**).

*Study Area*: refers areas which onsite ecological survey works were conducted as a part of this application. This includes the works envelope and additional areas which could be potentially affected by the development directly or indirectly. For this instance, the Study Area incorporated the Works Envelope with a buffer of 10m (refer to **Figure 2** for the Study Area).

*EEC*: denotes an Endangered Ecological Community as defined within the *Biodiversity Conservation Act 2016*.

Additional terminology associated with significance assessments (i.e. threatened species, populations, communities, threatening process, direct impacts, indirect impacts etc.) and the factors of such assessments (i.e. test of significance) are taken to be those existing within the *Biodiversity Conservation Act 2016*, *Environmental Planning and Assessment Act 1979*, and OEH documents entitled *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017) and *Threatened Species Test of Significance Guidelines (OEH 2018*). Additional terms within the report which warrant the source of the definition have been specifically referenced in the text.

Nomenclature for all plant species contained within this document follow Harden (1992, 1993, 2000 & 2003) The Flora of NSW Volumes 1-4. Scientific names for plants are used primarily in the document to avoid any confusion associated with use of common or descriptive plant names.

Nomenclature for all animal species contained within this document follows those utilised by the Office of Environment and Heritage/National Parks and Wildlife Service (2019) in association with the Atlas of NSW Wildlife. Scientific names for fauna are used primarily in the document to avoid any confusion associated with use of common or descriptive animal names.

## 2.7 Contributors

Contributors to this report and their roles are tabulated below:

**Table 1: Report Contributors**

| NAME | ORGANISATION | ROLE |
|---|---|---|
| Tomislav Rados | Planit Consulting | Report preparation, flora/fauna survey and assessment |

|  |  |  |
|---|---|---|
| Boyd Sargeant | Planit Consulting | Technical and quality assurance review |

All work was performed under the appropriate licences which are summarized within **Section 4.4**.

## 2.8 Biodiversity Offsets Scheme

The *Biodiversity Conservation Act 2016*, together with the *Biodiversity Conservation Regulation 2017*, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS).

The Biodiversity Offsets Scheme creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity. It also establishes biodiversity stewardship agreements, which are voluntary in-perpetuity agreements entered into by landholders, to secure offset sites.

The Scheme applies to:

- Local development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that is likely to significantly affect threatened species or triggers the Biodiversity Offsets Scheme threshold.
- State significant development and state significant infrastructure projects, unless the Secretary of the Department of Planning and Environment and the Chief Executive of OEH determine that the project is not likely to have a significant impact
- Biodiversity certification proposals
- Clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the Biodiversity Offsets Scheme threshold and does not require development consent
- Clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2016*
- Activities assessed and determined under Part 5 of the *Environmental Planning and Assessment Act 1979* (generally, proposals by government entities), if proponents choose to 'opt in' to the Scheme.

The Biodiversity Offsets Scheme Threshold is a test used to determine when is necessary to engage an accredited assessor to apply the Biodiversity Assessment Method (the BAM) to assess the impacts of a proposal.

It is used for local developments (development applications submitted to councils) and clearing that does not require development consent in urban areas and areas zoned for environmental conservation (under the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*).

The *Biodiversity Conservation Regulation 2017* sets out threshold levels for when the Biodiversity Offsets Scheme will be triggered. The threshold has two elements:

- whether the amount of native vegetation being cleared exceeds a threshold area set out below
- whether the impacts occur on an area mapped on the Biodiversity Values map published by the Minister for the Environment.

If clearing and other impacts exceeds either trigger, the Biodiversity Offset Scheme applies to the proposed development including biodiversity impacts prescribed by clause 6.1 of the *Biodiversity Regulation 2017*.

### *Biodiversity Values Map Threshold*

The Biodiversity Values Map identifies land with high biodiversity value, as defined by clause 7.3(3) of the *Biodiversity Conservation Regulation 2017*. The Biodiversity Offsets Scheme applies to all clearing of native vegetation and other biodiversity impacts prescribed by clause 6.1 of the *Biodiversity Regulation 2017* on land identified on the map.

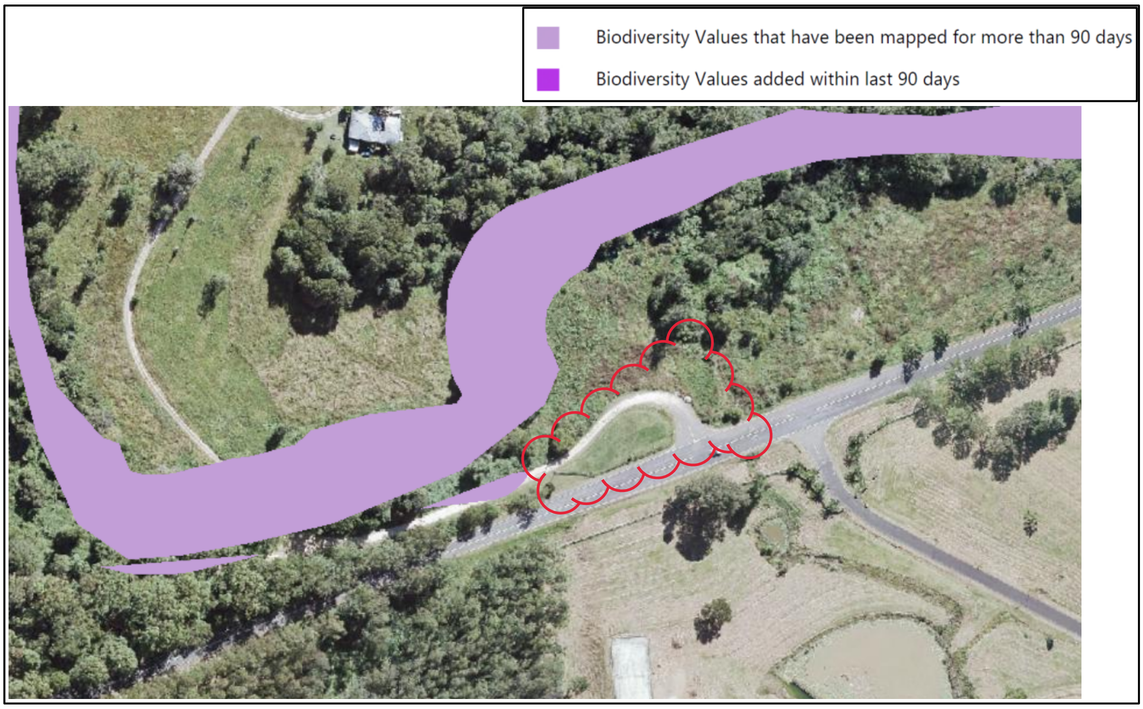
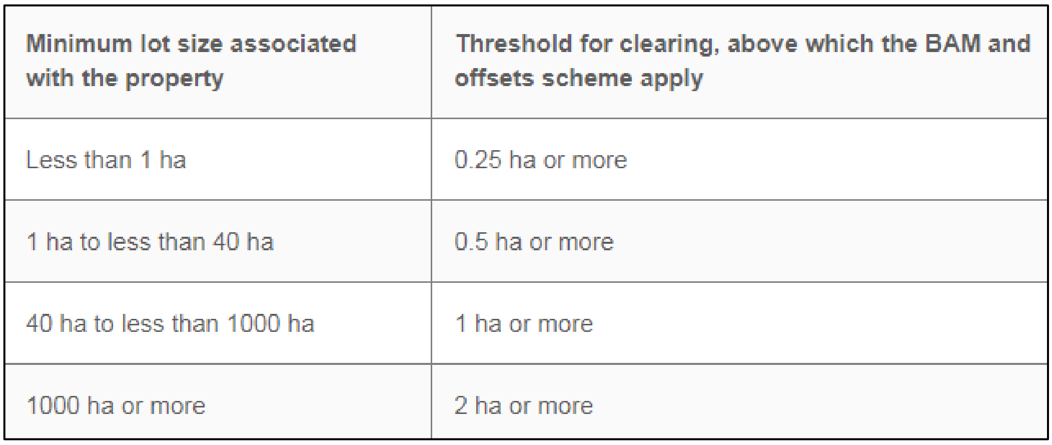

Biodiversity Values that have been mapped for more than 90 days
Biodiversity Values added within last 90 days

**Figure 6: Biodiversity Values Map with the Approx. Works Area Outlined Red**

Reviewing the Biodiversity Values Map (refer to **Figure 6**), the proposed works footprint does not occur within an area mapped as containing 'Biodiversity Values'.

### *Area Clearing Threshold*

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).



| Minimum lot size associated with the property | Threshold for clearing, above which the BAM and offsets scheme apply |
|---|---|
| Less than 1 ha | 0.25 ha or more |
| 1 ha to less than 40 ha | 0.5 ha or more |
| 40 ha to less than 1000 ha | 1 ha or more |
| 1000 ha or more | 2 ha or more |

**Figure 7: BOS Area Clearing Threshold**

The area threshold applies to all proposed native vegetation clearing associated with a proposal, regardless of whether this clearing is across multiple lots. In the case of a subdivision, the proposed clearing must include all future clearing likely to be required for the intended use of the land after it is subdivided / developed.

The minimum Lot size over the subject site is 0.04ha. Reviewing the BOS area clearing threshold, it is noted that threshold for native vegetation clearing is 0.25ha or more.

The proposal footprint is utilises existing roads and occurs within modified/disturbed areas, which are dominated by exotic species. The proposal seeks to remove eleven (11) native trees, of which are primarily juveniles (<8m in height). Further details regarding vegetation removal is provided in the latest sections of this report.

Reviewing the above, a BAM assessment will not be required for the proposal.

A Biodiversity Offset Scheme Entry Threshold (BOSET) report has been prepared for the works area and provided within **Attachment 3**.

### *Threatened Species 'Test of Significance'*

Proponents are also required to carry out a 'Test of Significance' for all local development proposals that do not exceed the Biodiversity Offset Scheme Threshold.

The 'Test of Significance' is intended to provide standardised and transparent consideration of threatened species, ecological communities, and their habitats, through the development assessment process.

In the context of a Part 4 development (not including major projects) if the 'Test of Significance' assessment indicates that there will be a significant impact, the proponent must carry out a BAM assessment.

Please refer to **Section 6** for the 'Test of Significance' conducted for the proposal.

# 3 VEGETATION ASSESSMENT

To identify and classify vegetation species and communities which occur within the Study Area, the following methodology was applied over ~3 hours total on the 5th December 2019:

- Desktop analysis including:
  i. Review of Council's Planning Scheme Mapping & Associated Reporting (i.e. Tweed LEP Maps, Draft LEP Amendment No 21 Mapping, Tweed VMP Maps 1-7, Tweed online Mapping)
  *ii.* Review of existing vegetation community documentation to confirm dominant elements, forest descriptions and conservation status of mapped forested remnants/ecosystems including:
    - Forestry Commission NSW (1989) *Research Note 17: Forest Types in NSW*.
    - National Parks and Wildlife Service (1999) *Forest ecosystem classification and mapping for the upper and lower north east cra regions*. CRA Unit-Northern Zone.
    - DECC (2008) *BioMetric: Terrestrial Biodiversity Tool for the NSW Property Vegetation Planning System: Definitions of Vegetation Types for CMA Areas* (online @ http://www.environment.nsw.gov.au/projects/Biometric Tool.htm)
    - Keith, D. (2004) *Ocean Shores to Desert Dunes*. The native vegetation of NSW. DECC, Hurstville.
    - Sheringham, P.R., Dr. Benwell, A., Gilmour, P., Graham, M.S., Westaway, J., Weber, L., Bailey, D., & Price, R. (2008). *Targeted Vegetation Survey of Floodplains and Lower Slopes on the Far North Coast*. A report prepared by the Department of Environment and Climate Change for the Comprehensive Coastal Assessment. Department of Environment and Climate Change (NSW), Coffs Harbour, NSW.

  iii. Review of threatened flora species and endangered ecological communities listed as occurring within the Murwillumbah (Qld – Southeast Hills and Ranges) CMA sub-region of the Northern Rivers CMA: (http://threatenedspecies.environment.nsw.gov.au/tsprofile/cma_subregion_list.aspx?id=15)

  iv. Review of search of the Atlas of NSW Wildlife database within a search area 10km surrounding the site to review threatened plant records

  v. Review of Environment Australia Protected Matters data within a search area 10km surrounding the site to review threatened plant records

  vi. Review of SEPP Mapping (Coastal Management) mapping to determine the indicative presence/absence of regional forest ecosystems reflective of wetland (marine, estuarine, riverine, lacustrine and/or palustrine) communities and/or Littoral Rainforests.

  vii. Review of selected ecological surveys previously undertaken in the locality

  viii. Review of the following legislation to ensure the latest lists of threatened species and communities were noted as well as investigating the existence of any relevant recovery plans, threat abatement plans, key threatening processes or any preliminary determinations which may be applicable to the site and/or the proposed use/action:
    - *Biodiversity Conservation Act (2016)*
    - *Environment Protection and Biodiversity Conservation Act (1999)*

- *Site survey including:*

i. Random Meander/Diversity Searches: Random searches within each vegetation community were undertaken recording all species observed was undertaken in accordance with Cropper (1993) and DEC (2004). Knowledge of known habitat of protected and uncommon floral species was utilized to target such species. Observation also included recording crown cover, tree heights and DBH estimation, dominant species present and identification of ecologically dominant layer.

The above survey techniques were applied to determine the following:

- Validate or modify existing vegetation mapping;
- Meet minimum Council and State Government vegetation/survey requirements;
- Identify floral species existing within the site;
- Measure and/or estimate Crown Cover (Walker and Hopkins, 1998, Nelder, 2004. EPA, 2005) to determine vegetation structure designations;
- Identify average height of canopy trees;
- Identify the incidence of senescent trees;
- Determine species dominance within ecologically dominant layer;
- Determine incidence of weed invasion and disturbance over the site and within vegetation strata;
- Determine incidence of species listed as endangered, vulnerable or rare under the *Biodiversity Conservation Act 2016;*
- Determine incidence of species listed as endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999.*

The above methodology is considered to be reasonably consistent with the intent of the following documents:

- NSW Department of Infrastructure, Planning and Natural Resources (1997) *Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997*.
- NSWNPWS (2001) *The Community Biodiversity Survey Manual*. New South Wales National Parks & Wildlife Service.
- QLD Department of Environment and Heritage (1999) *Suggested Conservation Criteria for Development Assessment*.
- Gold Coast City Council (2004) *Guidelines for preparing Ecological Site Assessments during the Development Process (v1.1)*. G.C.C.C., Nerang.
- Shire of Maroochy (1997) *Flora and Fauna Assessment Requirements for Developments in Maroochy Shire*. M.S.C
- Brisbane City Council (1999) *Ecological Assessment Guidelines*. B.C.C.
- Byron Shire Council *Guidelines for Ecological Assessment in Byron Shire*. B.S.C
- Walker, J. & Hopkins, M.S. (1998) Chapter 5: Vegetation in McDonald, R. C., Isbell, R.F., Speight, J.G., Walker, J. & Hopkins, M.S. *Australian Soil and Land Survey: Field Handbook Second Edition*. CSIRO Australia, Canberra.
- Nelder, V. J., Wilson, B.A., Thompson, E. J. & Dillewaard, H.A. (2004) *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. EPA, Brisbane.
- DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft*. DEC, NSW.

The above methodology is considered to be reasonably consistent with the intent of the following documents:

- NSW Department of Infrastructure, Planning and Natural Resources (1997) *Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997*.
- NSWNPWS (2001) *The Community Biodiversity Survey Manual*. New South Wales National Parks & Wildlife Service.
- QLD Department of Environment and Heritage (1999) *Suggested Conservation Criteria for Development Assessment*.
- Gold Coast City Council (2004) *Guidelines for preparing Ecological Site Assessments during the Development Process (v1.1)*. G.C.C.C., Nerang.
- Shire of Maroochy (1997) *Flora and Fauna Assessment Requirements for Developments in Maroochy Shire*. M.S.C
- Brisbane City Council (1999) *Ecological Assessment Guidelines*. B.C.C.
- Walker, J. & Hopkins, M.S. (1998) Chapter 5: Vegetation in McDonald, R. C., Isbell, R.F., Speight, J.G., Walker, J. & Hopkins, M.S. *Australian Soil and Land Survey: Field Handbook Second Edition*. CSIRO Australia, Canberra.
- Nelder, V. J., Wilson, B.A., Thompson, E. J. & Dillewaard, H.A. (2004) *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. EPA, Brisbane.
- DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft*. DEC, NSW.

## 3.1 Vegetation Survey Results

As a result of flora surveying one (1) vegetation community was identified within the Study Area and is described separately below. Where possible, identified communities were compared to recognized documents such as Forest Types in NSW (1989), CRA Forest Ecosystems (1999), Tweed VMP (2004) and Keith (2004) Ocean Shores-Desert Dunes. A vegetation community map has been produced for the Study Area (refer to **Figure 8**) with descriptions provided below.

### Vegetation Community 1: Modified / Cleared Areas with Weed Thickets, Regrowth and Scattered Trees

This community occupies the entire works footprint and Study Area. The community is highly disturbed and has been modified as a result of road works and historical rural/farming. Flooded Gum (*Eucalyptus grandis*) plantation occurs within the very southwest corner of the study area.

Several larger trees (~5-18m in height) were noted within the Kyogle Road road reserve (some of which were planted) which included Hoop Pine (Araucaria cunninghamii), Slash Pine (*Pinus elliottii*), Flooded Gum (*Eucalyptus grandis*), Grey Gum (*E. propinqua*), Northern Grey Ironbark (*E. siderophloia*), Riberry (*Syzygium luehmannii*), Canary Island Date Palm (*Phoenix canariensis*) and Blackwood (*Acacia melanoxylon*). Other tree species noted within the Study Area included Silky Oak (*Grevillea robusta*), Sandpaper Fig (*Ficus coronata*), Weeping Bottlebrush (*Callistemon viminalis*) and Foambark (*Jagera pseudorhus*).

Given the highly disturbed and modified nature of the area, weed species dominated the community, in particularly exotic grasses and herbaceous weeds.

The ground layer is dominated by exotic grasses, in particularly Pidgeon Grass (*Setaria spp.*). Additional grasses noted include Rhodes Grass (*Chloris gayana*), Couch (*Cynodon dactylon*), Guinea Grass (Megathyrsus maximus), Vasey Grass (*Paspalum spp.*), Kikuyu (*Pennisetum clandestinum*) and Red Natal Grass (*Melinis repens*). Height is dependent upon slashing/maintenance regimes. The road reserve and the entrances to Mebbin Drive and Outward Bound Australia a regularly maintained (<0.25cm in height), while areas in excluded paddocks, along fence lines or poorly accessible areas grasses extend to >1.2m in height.

Weed species are prevalent in this community and are common to rural properties in the locality and are generally referred to as 'pasture' weeds due to their common association with grazing and cropping uses.

In addition to the previously mentioned exotic grasses, areas proximate to the ephemeral drainage lines were dominated by Privets (*Ligustrum lucidum, L. sinense*), Wild Tobacco (*Solanum mauritianum*) and Castor Oil Plant (*Ricinus communis*).

Although not going into great detail, additional species noted during within the community included, Devil's Fig (*Solanum torvum*), Camphor Laurel (*Cinnamomum camphora*), Lantana (*Lantana camara*), Flaxleaf Fleabane (*Conyza bonariensis*), Purple Top (*Verbena bonariensis*), Easter Cassia (*Senna pendula var. glbrata*), Dandelion (*Taraxacum officinale*), Flatweed (*Hypochaeris radicata*), Paddy's Lucerne (*Sida rhombifolia*), Singapore Daisy (*Sphagneticola trilobata*), White Clover (*Trifolium repens*), Mist Flower (*Ageratina riparia*), Annual Ragweed (*Ambrosia artemisiifolia*), Groundsel Bush (*Baccaris halimifolia*), Cobbler's Pegs (*Bidens pilosa*), Crofton Weed (*Ageratina adenophora*), Blue Billygoat Weed (*Ageratum houstonianum*), Butterfly Bush (*Buddleja davidii*), Knotweed (*Persicaria spp.*), Curled Dock (*Rumex cripsus*), Madeira Vine (*Anredera cordifolia*), White Glycine (*Neonotonia wightii*) and Balloon Cotton Bush (*Gomphocarpus physocarpus*).

Although generally uncommon within the Study Area, native species were noted within the lower strata which included Native Raspberry (*Rubus parvifolius*), Blackwood (*Acacia melanoxylon*), Bracken Fern (*Pteridium esculentum*), Wandering Jew (*Commelina cyanea*), Spiny-head Mat-rush (*Lomandra longifolia*), Graceful Grass (*Ottochloa gracillima*), Basket Grass (*Oplismenus aemulus*), White Root (*Pratia purpurascens*) and Pastel Flower (*Pseuderanthemum variabile*).

Equivalent vegetation communities

Forest Types in NSW 1989: Code 220_Cleared/Partially Cleared

CRA Forest Ecosystems 1999: Code173_Cleared/Partially Cleared

Keith (2004) Ocean Shores-Desert Dunes: N/A

Tweed VMP 2004: Code 1099_ Substantially Cleared of Native Vegetation

A vegetation community plan has been prepared below (**Figure 8**).

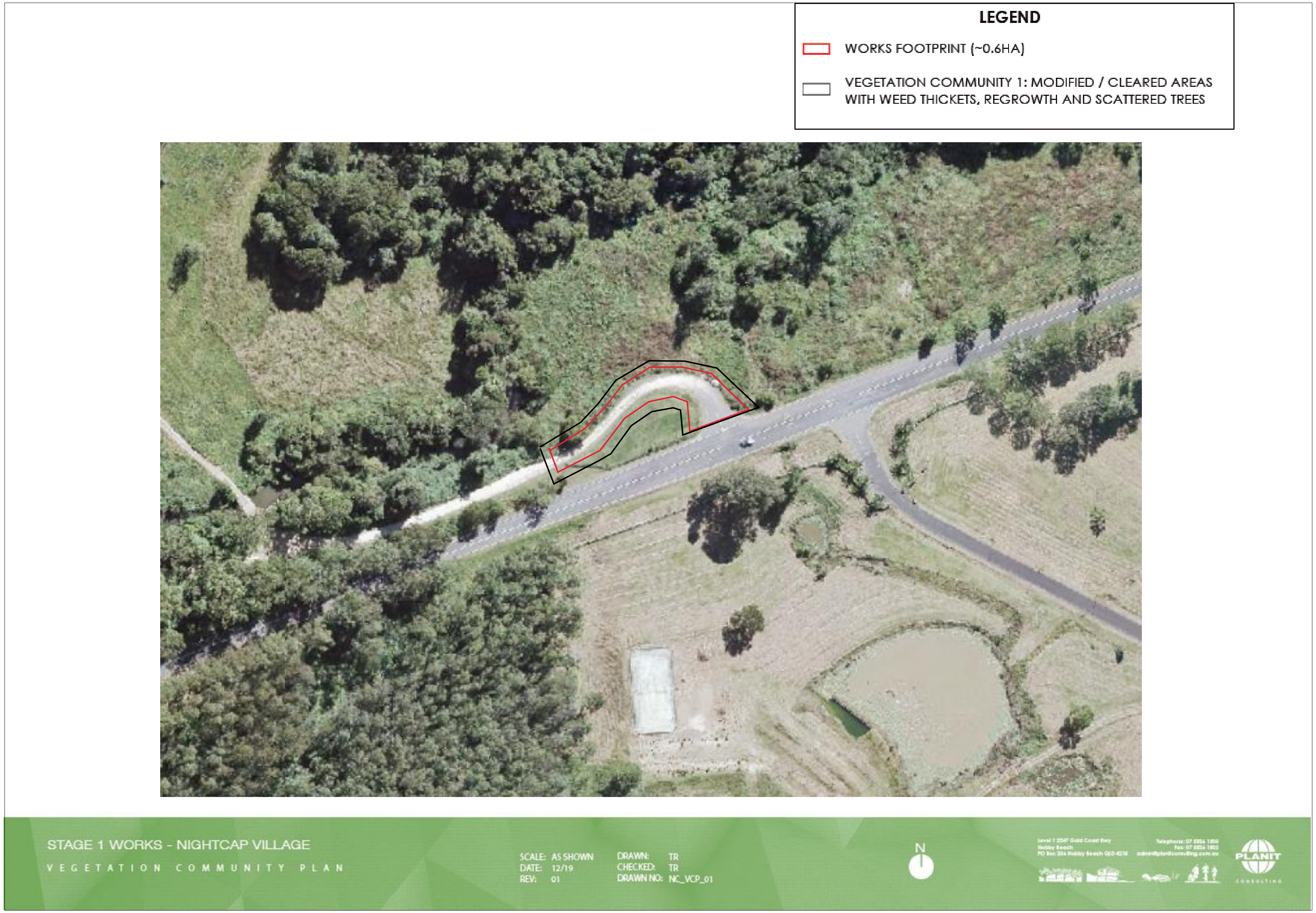

LEGEND
🟥 WORKS FOOTPRINT (~0.6HA)
▭ VEGETATION COMMUNITY 1: MODIFIED / CLEARED AREAS WITH WEED THICKETS, REGROWTH AND SCATTERED TREES
STAGE 1 WORKS - NIGHTCAP VILLAGE
VEGETATION COMMUNITY PLAN
SCALE: AS SHOWN
DATE: 12/19
REV: 01
DRAWN: TR
CHECKED: TR
DRAWN NO: NC_VCP_01
N
PLANIT
CONSULTING

**Figure 8: Vegetation Community Plan**

## 3.2 Endangered Ecological Communities

No vegetation communities recorded during the site inspection is considered to be reflective of an Endangered Ecological Community (EEC) scheduled under the *Biodiversity Conservation Act 2016*.

## 3.3 Threatened Ecological Communities

No vegetation communities recorded during the site inspection is considered to be reflective of a Threatened Ecological Community (TEC) scheduled under the *Environment Protection and Biodiversity Conservation Act 1999*.

# 4 FAUNA ASSESSMENT

This section describes the Study Areas' fauna and associated habitat as identified through surveying. The methodology applied to arrive at the species list is outlined and significant species have been identified where relevant.

## 4.1 Methodology

- Desktop analysis including:
  i. Review of Council's Planning Scheme Mapping and associated reporting

  ii. Review of threatened fauna species and endangered populations listed as occurring within the Murwillumbah (Qld - Southeast Hills and Ranges) CMA sub-region of the Northern Rivers CMA (http://threatenedspecies.environment.nsw.gov.au/tsprofile/cma_subregion_list.aspx?id=15

  iii. Review of search of the Atlas of NSW Wildlife database within a search area 10km surrounding the site to review threatened plant records

  iv. Review of selected ecological surveys/reports previously undertaken in the locality

  v. Review of the following legislation to ensure the latest lists of threatened species were noted as well as investigating the existence of any relevant recovery plans, threat abatement plans, key threatening processes or any preliminary determinations which may be applicable to the site and/or the proposed use/action:
     - *Biodiversity Conservation Act (2016)*
     - *Environment Protection and Biodiversity Conservation Act (1999)*
- Field survey of the flora communities located within and immediately adjacent to the Study Area (in accordance with Section 3 above) to review habitat values;
- The following fauna field survey methods were implemented on the 5th December 2019 in general accordance with the following:
  - DEC (2004) Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft. DEC, NSW.

- NSWNPWS (2001) The Community Biodiversity Survey Manual. New South Wales National Parks & Wildlife Service.
- Gold Coast City Council (2006) Planning Scheme Policy 8: Guidelines for Ecological Assessments. G.C.C.C., Nerang.
- Shire of Maroochy (1997) Flora and Fauna Assessment Requirements for Developments in Maroochy Shire. M.S.C
- Department of Land and Water Conservation (1997) Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997. NSWDLWC, Parramatta.
- Brisbane City Council (1999) Ecological Assessment Guidelines. B.C.C.
- Redland Shire's Planning Scheme Policy 4-Ecological Impacts

Weather conditions were hot during the day becoming cool at night (maximum of 35.1 C° and minimum of 13.3 C° as measured at Coolangatta AWS [94592]). No rainfall occurred during the onsite survey works. 15mm of rain fell on the 30th November 2019 and 1st December 2019, the week leading to the onsite survey works.

## 4.2 Fauna Survey Techniques

### 4.2.1 Diurnal Survey

- Binocular search and identification of all fauna heard or sighted;
- Bird identification surveys were conducted in association with dusk activity and comprised walked transects through the study area.

Duration: 1 x dusk (1 researcher x 60 minutes) [5th December 2019]

- Ground track/trace survey was performed including:
  - Scat/pellet examination
  - Scratch/trace examination of trees
  - Diggings, burrow, trace and track examination
  - Humus/crevice examination
  - Examination and assessment of any tree hollows, hanging bark, termite mounds, flowering and nesting trees etc.

Duration: 1 researcher x 30 minutes [5th December 2019] and opportunistic during other survey works

- Diurnal frog-call recognition and identification

Duration: Opportunistic during all other survey works.

- Ground strata searches and rock/timber/leaf litter rolls and examination for reptiles and frogs.

Duration: 1 researcher x 15 minutes during the middle of the day [5th December 2019], opportunistic during all other survey works.

### 4.2.2 Nocturnal Survey

Nocturnal survey included the following survey techniques:

- Audible survey for calls, scratching and landings;
- Spotlighting focusing on flowering and senescent trees, vegetated corridors, drainage lines, open grassland and canopy breaks utilising:
    - Short duration-long distance white light, and
    - Long duration-short distance red light

Duration: 1 x researcher on one night for 60 minutes [5th December 2019]

- Naked eye observation utilising dusk/moon light for bats and fauna returning to potential nest/shelter areas.

Duration: One dusk/evening [5th December 2019]

- Amphibian waterbody assessments were conducted at night along areas considered to represent potential habitat for amphibians (i.e. Drainage Lines). This included randomized walks adjacent the waterbodies actively looking for exposed frogs and active frogs and eyeshine. Aspects of the waterbody and adjacent areas were searched, including under rocks and logs, under bark, leaf litter and emergent vegetation. Call playback was conducted randomly for targeted species either from the surveyor's mobile phone, or on a 25W Toa Megaphone.

- Amplified call recording/playback for avifauna, mammals and amphibians. Playback of pre-recorded calls included the following threatened species:

    - Koala
    - Squirrel Glider
    - Yellow-bellied Glider
    - White-eared Monarch
    - Green-thighed Frog
    - Fleay's Barred Frog
    - Giant Barred Frog
    - Barking Owl
    - Powerful Owl
    - Masked Owl
    - Sooty Owl
    - Pale-vented Bush-hen
    - Wompoo Fruit-dove
    - Rose-crowned Fruit-dove
    - Superb Fruit-dove
    - Barred Cuckoo-shrike
    - Scarlet Robin
    - Eastern Bristlebird
    - Glossy Black-cockatoo
    - Marbled Frogmouth
    - Little Lorikeet

Each call playback session comprised of the following:

- A 5min listening period for unelicited fauna calls
- A 5min call playback for relevant species on a 25W Toa Megaphone
- A 5min search/spotlight for fauna at the playback site

Depending on the targeted species playback was undertaken at dusk and after dark. All call files were obtained from BOCA or NATURESOUND. The approximate locations of fauna survey plots (for defined methods such as call playback, spotlighting etc.) across the Study Area are depicted in **Figure 9**.

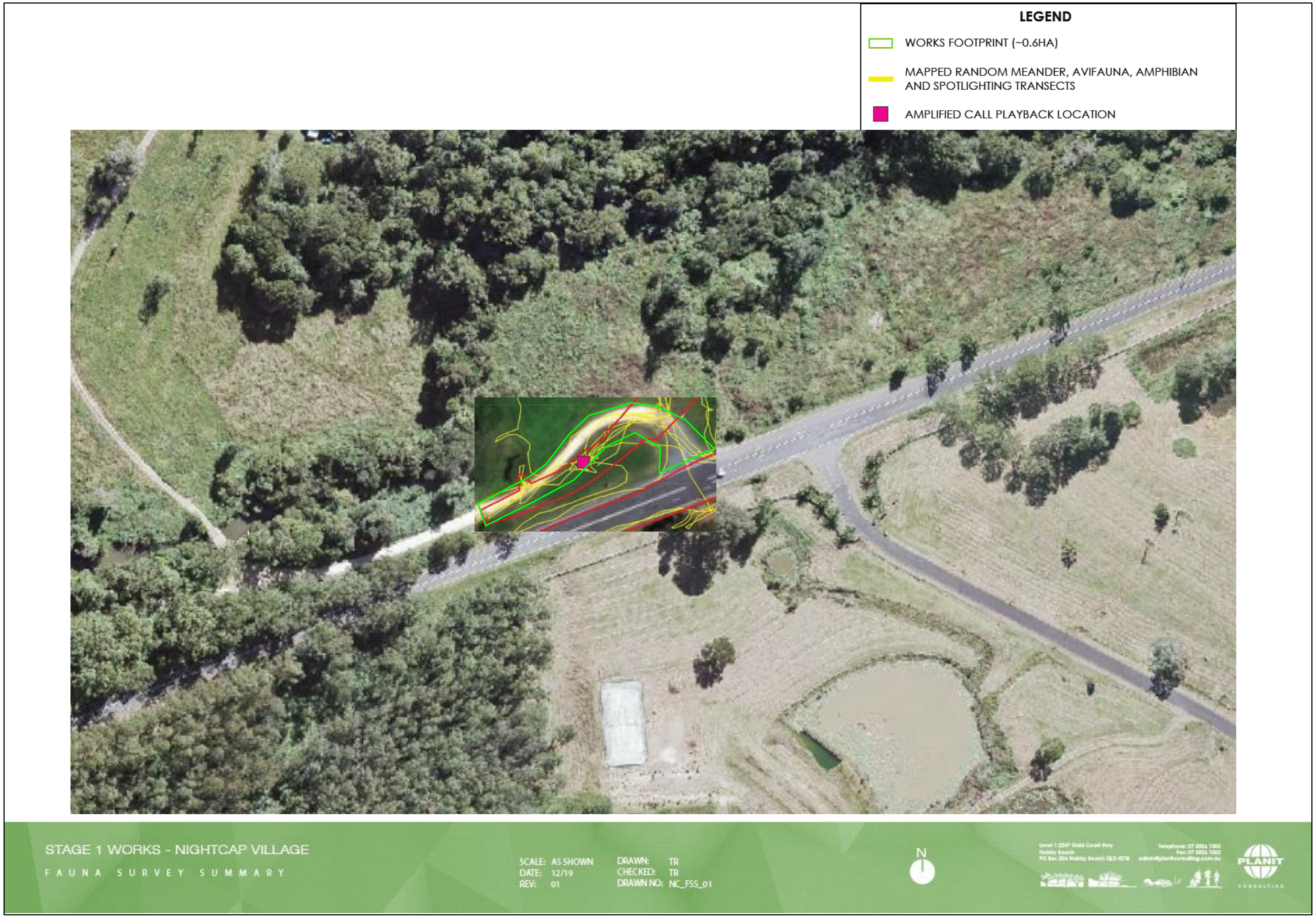

LEGEND
🟩 WORKS FOOTPRINT (~0.6HA)
MAPPED RANDOM MEANDER, AVIFAUNA, AMPHIBIAN AND SPOTLIGHTING TRANSECTS
🟥 AMPLIFIED CALL PLAYBACK LOCATION
STAGE 1 WORKS - NIGHTCAP VILLAGE
FAUNA SURVEY SUMMARY
SCALE: AS SHOWN
DATE: 12/19
REV: 01
DRAWN: TR
CHECKED: TR
DRAWN NO: NC_FSS_01
N
Level 1 2247 Gold Coast Hwy
Nobby Beach
PO Box 206 Nobby Beach QLD 4218
Telephone: 07 5526 1500
Fax: 07 5526 1502
admin@planitconsulting.com.au
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Figure 9: Fauna Survey Summary

## 4.3 Survey Limitations

Whilst the duration of flora surveys and inspections of the area are considered appropriate in the context of the small size of the works envelope (~6000sqm), undetected threatened or other native flora species may be present on the property. Seasonal surveys would also be necessary to detect flora species that are dormant or inconspicuous for part of the year (i.e. from the Asteraceae, Orchidaceae, Cyperaceae, Poaceae etc). Some of these species (dormant or non-flowering) may have been undetected or under-represented within the survey period. Further ungerminated seed of various species may have been present within the soil seed bank.

Whilst the duration and sampling methodology of the fauna survey is considered appropriate for the proposal site, it is acknowledged that the entire seasonal fauna assemblage is unlikely to be recorded. It is also accepted that although assessments of habitat and species ecology does provide an additional measure to anticipate the presence of species (as a surrogate for its actual observation), there is no absolute certainty to the absence of a species from marginal or potential habitat.

Additionally, there may be some species that may utilise the habitats within the site but have remained undetected due to their rarity, elusive nature or the sporadic utilisation of the habitats (i.e. the Long-nosed Potoroo, Common Planigale and Dunnart are elusive species that are difficult to trap or observe directly; the Black-necked Stork, Powerful Owl, Spotted-tail Quoll and Red Goshawk may only visit an area occasionally within a much larger home-range; the Swift Parrot and Regent Honeyeater may only visit an area during peak flowering periods etc.).

The conclusions of this report are therefore based upon data available at the time and the results of field works undertaken and are therefore indicative of the environmental condition of the site at the time of sampling, including the presence or otherwise of species. At should be acknowledged that site conditions, including the presence of threatened species, can change over time. Additionally, flora and fauna results from previous ecological studies of the site were taken into account.

The above limitations have been taken into account and the likelihood of threatened such species occurring within the site assessed through habitat assessment, records of the species within the locality and aspects of species ecology. Previously conducted ecological studies over the site have also been considered for this proposal.

## 4.4 Licencing

The following issued licences are held by the surveyors:

**Table 2: Relevant NSW Licences**

| Authority | Licence/Permit | Title | Expiration | Permit No. |
|---|---|---|---|---|
| NSW DPI Animal Care & Ethics Committee | Animal Research Approval | Fauna Surveying, Trapping & Release | 30 June 2020 | TRIM 14/1971 |
| NSW DPI Animal Care & Ethics Committee | Animal Research Authority | Fauna Surveying, Trapping & Release | 30 June 2020 | TRIM 14/1971 |
| NSW National Parks & Wildlife Service | Scientific Licence | Ecological Survey | 31 May 2020 | S100142 |

It is also noted that Tomislav Rados is an accredited assessor under the Biodiversity Offsets Scheme.

## 4.5 Habitat Assessment

Prior to the commencement of the abovementioned survey works within the Study Area a broad habitat assessment was conducted. The purpose of this overview was to determine potential occurrence of fauna based on available habitat components and to target areas for detailed surveying of protected fauna species. The following habitat components were reviewed and occur as a result of previous land use, vegetation types (refer **Section 3**), geomorphic variability, surrounding uses and hydraulic regime:

**Table 3: Habitat Features**

| Habitat Element/Feature | Comment |
|---|---|
| Presence of hollow bearing trees | Absent from proposed works footprint. Some hollows noted in proximity to the proposal area. |
| Presence of koala habitat and/or favoured koala trees | Absent. |
| Presence of caves, culverts or disused buildings suitable for roosting of microchiropteran bat species | Existing culvert present beneath Kyogle Road although considered unsuitable to represent potential microbat habitat. None were recorded while inspecting the culvert. |
| Presence of scratches or feeding scars on tree trunks | Scratches noted on several smooth-barked trees. |
| Presence of megabat roosting sites | Not recorded. Nearest known flying-fox roost camp occurs ~11km northeast of the site within Uki (DoEE, 2019). |
| Presence of creeklines, estuaries, mudflats, mangroves and/or riparian vegetation | Ephemeral drainage line traverses the works footprint in a north to south direction, although lacking typical riparian vegetation within the works footprint. Tweed River occurs approximately 20m northwest from the western portion of the works footprint, and approximately 50m from the northern extent of the works footprint. |
| Presence of dams, ponds, lakes and/or other natural or constructed permanent water sources | Absent. |
| Presence of dense understorey and ground cover vegetation | Abundant in association with exotic grasses and weed thickets. |
| Presence of deep leaf litter layer and/or debris (fallen logs etc.) | Abundant. |
| Presence of fruiting flora species | Marginal within works footprint. Some fruiting resources present in association with weed species (i.e. camphor laurel, privets, wild tobacco etc.) |
| Presence of flowering species | Scarce within works footprint. Some flowering resources present in association with Silky Oaks and Wattles. |
| Presence of large stick nests indicative of raptor presence | Not recorded. |
| Presence of rocky outcrops and/or extensive exposed rocky areas favoring reptile populations | Rocky debris/scree/gravel present in association with existing internal track. |

## 4.6 Fauna Survey Results

The following section(s) list the fauna species recorded on the subject site during detailed surveying and lists the methods by which each species was identified. Results are grouped by the Class of species recorded. Those techniques utilised to record fauna are listed below and correlate with the acronyms included within the Survey Methods column of the grouped Survey Results tables. All bolded fauna species are threatened under the *BC Act 2016*.

Survey Method Codes:

| | |
|---|---|
| A | Stranding/beached |
| AR | Acoustic recording |
| B | Burnt |
| C | Cat kill |
| D | Dog kill |
| E | Nest/roost |
| F | Tracks, scratchings |
| FB | Burrow |
| G | Crushed Cones |
| H | Hair, feathers or skin |
| I | Subfossil/Fossil Remains |
| K | Dead |
| O | Observed |
| OW | Observed and Heard call |
| P | Scat |
| Q | Camera |
| R | Road kill |
| S | Shot |
| T | Trapped or netted |
| U | Ultrasonic recording |
| V | Fox kill |
| W | Heard call |
| X | In scat |
| Y | Bone, teeth or shell |
| Z | In raptor/owl pellet |

* All birds were either directly observed through diurnal survey, spotlighting, camera trap or call identification

** Introduced/feral species

*** Recorded in adjacent areas or circling overhead

**BIRDS***

| FAMILY | SPECIES NAME | COMMON NAME |
|---|---|---|
| Anatidae | *Chenonetta jubata* | Australian Wood Duck |
| Columbidae | *Geopelia humeralis* | Bar-shouldered Dove |
| Threskiornithidae | *Threskiornis molucca* | Australian White Ibis |
| Accipitridae | *Elanus axillaris* | Black-shouldered Kite |
| Rallidae | *Porphyrio porphyrio* | Purple Swamphen |
| Charadriidae | *Vanellus miles* | Masked Lapwing |
| Cacatuidae | *Cacatua galerita* | Sulphur-crested Cockatoo |
| Cacatuidae | *Calyptorhynchus funereus* | Yellow-tailed Black Cockatoo |
| Cacatuidae | *Eolophus roseicapillus* | Galah |
| Psittacidae | *Trichoglossus chlorolepidotus* | Scaly-breasted Lorikeet |
| Psittacidae | *Trichoglossus haematodus* | Rainbow Lorikeet |
| Alcedinidae | *Dacelo novaeguineae* | Laughing Kookaburra |
| Coraciidae | *Eurystomus orientalis* | Dollarbird |
| Maluridae | *Malurus lamberti* | Variegated Fairy-wren |
| Meliphagidae | *Entomyzon cyanotis* | Blue-faced Honeyeater |
| Meliphagidae | *Lichmera indistincta* | Brown Honeyeater |
| Meliphagidae | *Manorina melanocephala* | Noisy Miner |
| Meliphagidae | *Manorina melanophrys* | Bell Miner |
| Meliphagidae | *Myzomela sanguinolenta* | Scarlet Honeyeater |
| Meliphagidae | *Philemon corniculatus* | Noisy Friarbird |
| Meliphagidae | *Phylidonyris niger* | White-cheeked Honeyeater |

| FAMILY | SPECIES NAME | COMMON NAME |
|---|---|---|
| Psophodidae | *Psophodes olivaceus* | Eastern Whipbird |
| Campephagidae | *Coracina novaehollandiae* | Black-faced Cuckoo-shrike |
| Artamidae | *Cracticus nigrogularis* | Pied Butcherbird |
| Artamidae | *Cracticus tibicen* | Australian Magpie |
| Dicruridae | *Dicrurus bracteatus* | Spangled Drongo |
| Rhipiduridae | *Rhipidura leucophrys* | Willie Wagtail |
| Corvidae | *Corvus orru* | Torresian Crow |
| Monarchidae | *Grallina cyanoleuca* | Magpie-lark |
| Timaliidae | *Zosterops lateralis* | Silvereye |
| Hirundinidae | *Hirundo neoxena* | Welcome Swallow |
| Estrildidae | *Neochmia temporalis* | Red-browed Finch |
| Estrildidae | *Taeniopygia bichenovii* | Double-barred Finch |

## MAMMALS

| FAMILY | SCIENTIFIC NAME | COMMON NAME | METHOD |
|---|---|---|---|
| Pseudocheiridae | *Pseudocheirus peregrinus**** | Common Ringtail Possum | O |
| Macropodidae | *Macropus giganteus* | Eastern Grey Kangaroo | R |
| Pteropodidae | *Pteropus alecto* | Black Flying-fox | OW |
| **Pteropodidae** | ***Pteropus poliocephalus*** | **Grey-headed Flying-fox** | **OW** |
| Canidae | *Canis lupus familiaris*** | Dog | W |
| Leporidae | *Lepus capensis*** | Brown Hare | O |

## REPTILES

| FAMILY | SCIENTIFIC NAME | COMMON NAME | METHOD |
|---|---|---|---|
| Scincidae | *Lampropholis delicata* | Dark-flecked Garden Sunskink | O |
| Agamidae | *Intellagama lesueurii* | Eastern Water Dragon | O |
| Elapidae | *Pseudonaja textilis* | Eastern Brown Snake | O |

## AMPHIBIANS

| FAMILY | SCIENTIFIC NAME | COMMON NAME | METHOD |
|---|---|---|---|
| Myobatrachidae | *Crinia signifera* | Common Eastern Froglet | W |
| Hylidae | *Litoria fallax* | Eastern Dwarf Tree Frog | W |
| Hylidae | *Litoria nasuta* | Rocket Frog | OW |
| Bufonidae | *Rhinella marina*** | Cane Toad | OW, R |

# 5 DISCUSSION OF RECORDED & POTENTIALLY OCCURRING SCHEDULED COMMUNITIES, POPULATIONS AND SPECIES CONSERVATION SIGNIFICANCE

## 5.1 Endangered Populations

Endangered populations are listed under Schedule 1 of the *Biodiversity Conservation Act 2016*. No endangered populations occur within the site with the nearest being 'Koala population between the Tweed River and Brunswick River east of the Pacific Highway (Goldfuss, 1817). It is noted that the site occurs approximately 26km west of the Pacific Highway and is well removed from this Endangered Population.

## 5.2 Threatened Flora Species

No flora species listed scheduled under the *Biodiversity Conservation Act 2016* was observed within the Study Area during survey efforts. Additionally, no flora species scheduled under the *Environment Protection and Biodiversity Conservation Act 1999* was recorded.

A search of the NPWS 'Atlas of NSW Wildlife' (2019) determined that seventeen (17) species of threatened flora have been previously recorded within the locality (search area: North: -28.43; West: 153.19; East: 153.29 South: -28.53). Searches throughout the occurring vegetation communities within the Study Area were undertaken to locate the presence or absence of these species which are tabulated below.

It is considered that preferred habitat for the majority of the nominated species is absent from the proposed development area. Notwithstanding, searches were undertaken to locate the presence or absence of the tabled species. As the species were not recorded within the proposal envelope (or areas immediately adjacent), further assessment is considered unnecessary.

**Table 4: Potentially Occuring Threatened Flora Species**

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
|---|---|---|---|---|
| *Davidsonia jerseyana* | The Davidson's Plum is restricted to the Brunswick and Tweed River catchments of the north coast of NSW. The southern-most confirmed record of the species is located near Mullumbimby.<br>Records extend only a short distance inland on the Brunswick River. The northern-most and westernmost confirmed record is at Chillingham. There is an unconfirmed record further north near the border gate at Tomewin (Watson 1987). There are no confirmed records for southern Queensland. The species has been documented as occurring at a total of 118 point locations, which can be roughly grouped into 24 naturally occurring sub-populations,<br>The Davidson's Plum is found in coastal and lowland subtropical rainforest and wet sclerophyll forest, often with an overstorey including *Lophostemon confertus* (Brush Box), *Araucaria cunninghamii* (Hoop Pine) and/or eucalypt species. Species commonly occurring at Davidson's Plum sites include *Acacia bakeri* (Marblewood), *Cupaniopsis newmanii* (Longleaved Tuckeroo), *Endiandra 29tilize* (Black Walnut), *Eucalyptus microcorys* (Tallowwood), *Flindersia bennettiana* (Bennett's Ash), *Flindersia schottiana* (Cudgerie), *Pentaceras 29tilize* (Crow's Ash), *Synoum glandulosum* (Scentless Rosewood) and the introduced *Cinnamomum camphora* (Camphor Laurel) (McKinley & Stewart 1999). Several sub-populations of the Davidson's Plum are known from areas of regrowth rainforest with a high percentage of Camphor Laurel, *Lantana camara* (Lantana) and other exotic weeds. Some trees are isolated in paddocks or in road reserves (McKinley & Stewart 1999) [in NPWS, 2004). | E | E | Not recorded. No impact expected. |
| *Doryanthes palmeri* | The Davidson's Plum is restricted to the Brunswick and Tweed River catchments of the north coast of NSW. The southern-most confirmed record of the species is located near Mullumbimby.<br>Records extend only a short distance inland on the Brunswick River. The northern-most and westernmost confirmed record is at Chillingham. There is an unconfirmed record further north near the border gate at Tomewin (Watson 1987). There are no confirmed records for southern Queensland. The species has been documented as occurring at a total of 118 point locations, which can be roughly grouped into 24 naturally occurring sub-populations, | V | - | Not recorded. No impact expected. |

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
|---|---|---|---|---|
| | The Davidson's Plum is found in coastal and lowland subtropical rainforest and wet sclerophyll forest, often with an overstorey including *Lophostemon confertus* (Brush Box), *Araucaria cunninghamii* (Hoop Pine) and/or eucalypt species. Species commonly occurring at Davidson's Plum sites include *Acacia bakeri* (Marblewood), *Cupaniopsis newmanii* (Longleaved Tuckeroo), *Endiandra 30tilize* (Black Walnut), *Eucalyptus microcorys* (Tallowwood), *Flindersia bennettiana* (Bennett's Ash), *Flindersia schottiana* (Cudgerie), *Pentaceras 30tilize* (Crow's Ash), *Synoum glandulosum* (Scentless Rosewood) and the introduced *Cinnamomum camphora* (Camphor Laurel) (McKinley & Stewart 1999). Several sub-populations of the Davidson's Plum are known from areas of regrowth rainforest with a high percentage of Camphor Laurel, *Lantana camara* (Lantana) and other exotic weeds. Some trees are isolated in paddocks or in road reserves (McKinley & Stewart 1999) [in NPWS, 2004]. | | | |
| *Fontainea australis* | Southern Fontainea is known from the Tweed Valley and a few locations in the upper reaches of the Richmond Valley in NSW (DECC, 2005a), north to Currumbin Valley and Springbrook National Park (NP) in southern Queensland (Barry & Thomas, 1994; Queensland Herbarium, 2008). Recorded occurrences in NSW include Nightcap NP, Numinbah Nature Reserve (NR), Goonengerry State Forest, Limpinwood NR, Mount Warning NP, Inverell Shire, and the Border Ranges (Floyd, 1989; Briggs & Leigh, 1996; NSW NPWS, 2004; Inverell Shire Council, 2006; NHT, 2006).<br>Southern Fontainea occurs in lowland subtropical rainforest and complex notophyll vine forest on basaltic alluvial flats and well drained, bright reddish-brown alluvial clay loam (Jessup & Guymer, 1985; Floyd, 1989; Barry & Thomas, 1994). It has been recorded at higher altitudes in the Nightcap Range (NSW NPWS, 2002). Southern Fontainea has been recorded growing in White Booyong (Heritiera trifoliolata) Subtropical Rainforest Alliance (Floyd, 1989), and in vine forests with Eucalyptus grandis emergents (Barry & Thomas, 1994). | V | V | Not recorded. No impact expected. |
| *Desmodium acanthocladum* | The Thorny Pea occurs mainly in the Lismore area of north-eastern NSW, but there are also records of the species from near Grafton, Coraki, Casino and the Mount Warning area (DECC, 2005a). The species has been recorded in two reserves — the Mount Warning National Park (though this is a very old record from 1898) and Andrew Johnston Big Scrub Nature Reserve (NSW NPWS, 2007). This species occurs within the Northern Rivers (NSW) Natural Resource Management Region. | V | V | Not recorded. No impact expected. |

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
|---|---|---|---|---|
| | The Thorny Pea occurs on basalt-derived soils at low elevations, mainly along rivers (Harden, 1991), in dry rainforest and on the fringes of riverine subtropical rainforest (DECC, 2005a). [in DSEWPC, 2008:1]. | | | |
| *Endiandra hayesii* | The Davidson's Plum is restricted to the Brunswick and Tweed River catchments of the north coast of NSW. The southern-most confirmed record of the species is located near Mullumbimby.<br>Records extend only a short distance inland on the Brunswick River. The northern-most and westernmost confirmed record is at Chillingham. There is an unconfirmed record further north near the border gate at Tomewin (Watson 1987). There are no confirmed records for southern Queensland. The species has been documented as occurring at a total of 118 point locations, which can be roughly grouped into 24 naturally occurring sub-populations,<br>The Davidson's Plum is found in coastal and lowland subtropical rainforest and wet sclerophyll forest, often with an overstorey including *Lophostemon confertus* (Brush Box), *Araucaria cunninghamii* (Hoop Pine) and/or eucalypt species. Species commonly occurring at Davidson's Plum sites include *Acacia bakeri* (Marblewood), *Cupaniopsis newmanii* (Longleaved Tuckeroo), *Endiandra 31tilize* (Black Walnut), *Eucalyptus microcorys* (Tallowwood), *Flindersia bennettiana* (Bennett's Ash), *Flindersia schottiana* (Cudgerie), *Pentaceras 31tilize* (Crow's Ash), *Synoum glandulosum* (Scentless Rosewood) and the introduced *Cinnamomum camphora* (Camphor Laurel) (McKinley & Stewart 1999). Several sub-populations of the Davidson's Plum are known from areas of regrowth rainforest with a high percentage of Camphor Laurel, *Lantana camara* (Lantana) and other exotic weeds. Some trees are isolated in paddocks or in road reserves (McKinley & Stewart 1999) [in NPWS, 2004) | V | V | Not recorded. No impact expected.<br>Several trees were previously recorded by the surveyor within Mebbin National Park (photo below).<br> |
| *Endiandra muelleri subsp. bracteata* | 'According to the literature the Green-leaved Rose Walnut is known from north-eastern NSW, north from the Clarence River (where a specimen from Maclean was employed in Hyland's 1989 description) to southern and central Queensland (Hyland 1989). The taxon is not considered threatened in Queensland, and is apparently moderately common. In NSW, records nominally of this taxon are concentrated on the Tweed and Byron coasts, but also extend inland to the hinterland ranges, and south to Tuckean, Bungawalbin and Maclean. | E | - | Not recorded. No impact expected.<br>The species has been previously recorded within the locality by the surveyor (pers obs.). |

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
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| | Records for the combined taxa (E. hayesii and E. muelleri subsp. bracteata) are usually from the poorer soils derived from sedimentary, metamorphic or acid volcanic rocks. Vegetation includes subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats' (NPWS, 2004: 5). | | | |
| *Owenia cepiodora* | This species is known from subtropical and dry rainforest on or near soils derived from basalt from the Richmond River north to just north of the Qld border (DEC, 2005; BSC, 2006) | V | V | Not recorded. No impact expected.<br>The species has been recently recorded by the surveyor along the edge of Bog Onion Road within Mebbin National Park (photo below). |

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
|---|---|---|---|---|
| | | | | <br>The species was not recorded within the works footprint during flora surveys. |
| *Gossia fragrantissima* | This species is known from dry subtropical and riverine rainforest mostly on basaltic soils (NPWS, 2002). | E | E | Not recorded. No impact expected. |
| *Rhodamnia rubescens* | In New South Wales (NSW), *Rhodamnia rubescens* is currently known to occur from coastal districts north from Batemans Bay, approximately 280 km south of Sydney, to the Queensland (Qld) border. Populations of the species extend north to Maryborough, Qld. NSW populations of R. rubescens are mainly coastal and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000–1,600 mm (Benson and McDougall 1998).<br>Populations and individuals of R. rubescens are often found in wet sclerophyll associations in rainforest transition zones and creekside riparian vegetation (Benson and McDougall 1998). *Rhodamnia rubescens* commonly occurs in all rainforest subforms except cool temperate rainforest. The species occupies a range of volcanically derived and sedimentary soils and is also a common pioneer species in eucalypt forests (Floyd 1989). | CE | - | Not recorded. No impact expected.<br>The species has been regularly recorded by the surveyor within the locality (photo below), |

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
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| *Rhodomyrtus psidioides* | In New South Wales (NSW), Rhodomyrtus psidioides is currently known to occur from Broken Bay, approximately 30 km north of Sydney, to the Queensland (Qld) border. Populations of the species extend north to Gympie, Qld. NSW populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges.<br>The species occurs in rainforest and its margins with sclerophyll vegetation, often near creeks and drainage lines. *Rhodomyrtus psidiodes* is a pioneer species in disturbed environments (Williams and Adam 2010) and is locally common in disturbed areas, such as regrowth and rainforest margins. | CE | - | Not recorded. No impact expected. |
| *Peristeranthus hillii* | *Peristeranthus hillii* is found in north eastern NSW, north from the Hastings River (Port Macquarie), and extends to north eastern Queensland, as far as the Bloomfield River. In subtropical regions, including NSW, the species is restricted to coastal and near-coastal environments, particularly remnants of littoral rainforest growing on aeolian sands and lowland subtropical rainforest on floodplains. | V | - | Not recorded. No impact expected. |
| *Sarcochilus hartmannii* | Waxy Sarcochilus is known from the Richmond River in northern NSW to Main Range National Park in south-eastern Queensland. It grows on volcanic rocks, shallow soils and exposed cliffs in sclerophyll forests, rainforest margins or open | V | V | Not recorded. No impact expected. |

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
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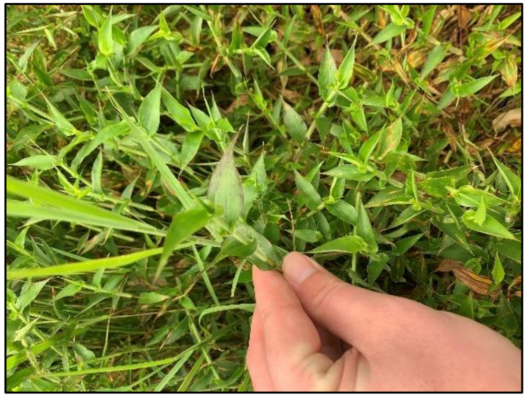
| | areas at 500–1000 m altitude. It is also found occasionally at the base of fibrous trunks of trees, including cycads and grasstrees (Stanley & Ross, 1989; Weston, 1993; DECC, 2005a). | | | |
| *Arthraxon hispidus* | "In NSW and Queensland, Hairy-joint Grass is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps (Queensland CRA/RFA Steering Committee, 1997, 1998; DECC NSW, 2005), as well as woodland (Queensland Herbarium, 2008). In south-east Queensland, Hairy-joint Grass has also been recorded growing around freshwater springs on coastal foreshore dunes, in shaded small gullies, on creek banks, and on sandy alluvium in creek beds in open forests (Queensland CRA/RFA Steering Committee, 1997, 1998), and also with bog mosses in mound springs (Queensland Herbarium, 2008)" [Department of the Environment, Water, Heritage and the Arts 2008:1-2] | V | V | Potential habitat for the species occurs in shaded lower laying areas of the site proximate to streams, gullies and the edge of forests.<br>The species was not recorded during flora survey efforts.<br>The species has been observed earlier in the year by the surveyor at Koala Beach Estate (photo below).<br> |
| *Floydia praealta* | The Ball Nut occurs in small, scattered populations from Gympie, Queensland, southwards to the Clarence River in north-east NSW, where it inhabits riverine and subtropical rainforest, usually on soils derived from basalt (DECC, 2005) or in coastal scrub (Foreman, 1995). | V | V | Not recorded. No impact expected. |
| *Macadamia tetraphylla* | This species of nut tree is confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland where it | V | V | Although preferred rainforest type habitat is absent from the development footprint, this species is |

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
|---|---|---|---|---|
|  | occurs within subtropical rainforest, particularly on basaltic soils. (Williams, Harden and McDonald, UNE, 1984; DECC, 2005). The species is also commonly noted as a paddock tree on soils of basaltic influence and as an ornamental or orchard tree associated with residential and/or rural activities (pers.obs.). |  |  | widely cultivated and commonly recorded as planted specimens within rural lands. Easily identifiable species that was not recorded during targeted flora surveys of the development footprint. No impact expected.<br>Several planted specimens within garden beds were noted at the rear of Sphinx Rock Café ~2km southwest from the works area (photo below).<br> |

| Species | Preferred Habitat | BCA Status | EPBC Status | Expected Impact |
|---|---|---|---|---|
| *Pomaderris notata* | The species occurs in Queensland and reaches its southern distributional limit in New South Wales. In New South Wales it is known from rocky basalt ranges in montane heaths and scrubs, or in depauperate rainforest. It has been collected from the McPherson and Tweed Range areas of far northern New South Wales (NSW Scientific Committee, 2018). | V | - | Not recorded. No impact expected. |
| *Zieria adenodonta* | Occurs only near the top of Mount Warning in the Tweed district in NSW. Also occurs in South-east Queensland (OEH, 2019B).<br>Found in dense shrubby vegetation on steep rocky slopes, with tea-tree, bottlebrushes and grass-trees (OEH, 2019B). | E | - | Not recorded. No impact expected. |

Note: *E1 = Endangered (BCA, 2016); E = Endangered (EPBC 1999); E4A = Critically Endangered (BCA, 2016); CE = Critically Endangered (EPBC 1999); and V = Vulnerable (BCA, 2016 and EPBC 1999)*

## 5.3 Threatened Fauna Species

A search of the NPWS 'Atlas of NSW Wildlife' (2019) has determined that forty-eight species of threatened fauna have been previously recorded within the locality (search area: North: -28.43; West: 153.19; East: 153.29; South: -28.53).

A review of available habitats and the ecology of the database listed species (i.e. range, preferred habitat, home range etc.) indicate that it is unlikely that all of these previously recorded species in the locality would rely on the habitats of the Study Area. Subsequently several such threatened species are considered unlikely to be significantly affected by a future development of the site for one or more of the following reasons:

- Core/favoured habitats were not recorded in the Study Area
- Resources used by the species are unlikely to be adversely affected or only likely to be minimally affected by a future proposal.

Details of such species requirements and reasons for not considering impacts to these species further are discussed below (**Table 5**). A number of threatened species have been excluded from discussion in the below table where they are considered reasonably unlikely occurrences and impacts are unlikely to be occasioned as a result of the proposal due to the following:

- Being a marine reptile or mammal (i.e. whale, turtle, seal).
- Being a pelagic seabird, wader bird or inter-tidal zone coastal bird (i.e. tern, godwit, oystercatcher).

For species considered a potential occurrence (based upon distribution, database recording, suitable habitat present etc.) or which were recorded within or directly adjacent the site during the survey period and for which it is considered that the species may be affected (i.e. impact on feeding, roosting, nesting, behaviour and associated habitat), the 'test of significance' is performed.

Notwithstanding, all the species tabled below were targeted during the fauna survey or were reviewed in the context of documented ecology and available habitats.

**Table 5: Potentially Occurring Threatened Fauna Species**

| Species | Potential occurrence based upon known habitat & range | Notes | BCA Status | EPBC Status | Bionet records within 10km | Potential for the species or associated habitat to be impacted upon by proposal |
|---|---|---|---|---|---|---|
| Pouched Frog (*Assa darlingtoni*) | Unlikely | Pouched Frogs occur in cool, moist, mountainous rainforest (mostly above 800m) in the area near the Queensland / N.S.W border where they live among the leaf litter and under rocks and logs (DEC, 2005; Barker et al, 1995; FATS, 1994).<br>Preferred habitat for the pouched frog is absent from the works footprint. The species was not recorded during surveys. | V | - | 8 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |
| Giant Barred Frog (*Mixophyes iteratus*) | Unlikely | The Giant Barred Frog occurs in rainforests and wet sclerophyll forests in upper to lower catchment areas (Ingram & McDonald 1993). During surveys in the Cooroy to Curra area of south-east Queensland, Giant Barred Frogs were observed to prefer a closed forest canopy with a relatively light cover of vegetation at ground level (Aland & Wood 2013). Populations of the species have been found in cleared or disturbed areas, for example cattle farms with vegetated riparian strips and regenerated logged areas (Hero & Shoo n.d., cited in Hines et al. 2004; Ingram & McDonald 1993). Many sites where the Giant Barred Frog is known to occur are the lower reaches of streams which have been affected by major disturbances such as clearing, timber harvesting and urban development in their headwaters (Hines et al. 1999). | E | E | 28 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal.<br>The species has been previously recorded by the surveyor along several watercourses within the locality (photo below).<br> |
| Green-thighed Frog (*Litoria brevipalmata*) | Unlikely | The Green-thighed Frog is a poorly understood and relatively recently discovered species which occurs within forests and swamps of the coast and adjacent ranges from central NSW to SEQLD (Cogger, 2000; Barker et al, 1995, Hines et al, 1999). Robinson (1993), Griffiths (1997) and Cogger (2000) list the breeding season as summer whereas Barker *et al.* (1995) record it as October and January. Calling has been documented to last for only a few days at a time (Nattrass and Ingram 1993; Barker *et al.* 1995) and has been noted to occur in association with "heavy rains" (*Barker et* al.1995; Ehmann 1997). Males are noted to call around flooded semi-permanent or ephemeral pools, usually in grassy areas (Robinson 1993; Barker *et al.* 1995; Cogger 2000). This species may have varying habitat requirements across its range. Cogger (2000), Robinson (1993) and Barker *et al.* (1995) all record this species to be associated with moist forests (swamp forests, wet sclerophyll forest and rainforest). However, records from the northern parts of its range appear to predominantly come from dry sclerophyll forest (McDonald 1974; Czechura 1978; Nattrass and Ingram 1993; Aridis, 1996) [in Lemckert et al, 2006: 1]. | V | - | 1 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |
| Stephens' Banded Snake (*Hoplocephalus stephensii*) | Unlikely | This species in found on the coast and ranges from Southern Queensland to Gosford in NSW. The Stephens' Banded Snake occupies rainforest and eucalypt forests and rocky areas up to 950 m in altitude. Stephens' Banded Snake is nocturnal, and shelters between loose bark and tree trunks, amongst vines, or in hollow trunks limbs, rock crevices or under slabs during the day. | V | - | 1 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |

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| Wompoo Fruit-Dove (*Ptilinopus magnificus*) | Possible | This species is confined to mature rainforest and adjacent wet sclerophyll environments in eastern Australia from Cape York to around Coffs Harbour. As an obligate frugivore it requires a high availability of fruiting materials which it generally feeds on in the high canopy (Recher et al, 1995). | V | - | 27 | Favoured habitat for this species is considered to be absent from the works footprint, although the species may potentially forage upon some of the site's fruiting trees (primarily limited to camphor laurel, privets and figs).<br>It is considered that the removal of several potential forage trees (primarily weed species) will not have a significant impact upon the species considering the abundance of surrounding connected bushland containing fruiting species (i.e. Mebbin National Park).<br>The species was previously recorded by the surveyor within Mebbin National Park. |
| Rose-crowned Fruit-Dove (*Ptilinopus regina*) | Possible | This species generally occurs within sub-tropical rainforest, camphor laurel and occasionally wet sclerophyll and swamp forests which contain suitable fruiting species for foraging (DEC, 2005; Recher et al, 1995). As an obligate frugivore a high proportion of fruiting species (figs, lillipillis, laurels etc.) is necessary and as such rainforest habitats are favoured. The species is considered a partial migrant and moves north in autumn/winter and returning in spring/summer to breed (Recher et al, 1995). | V | - | 11 | Favoured habitat for this species is considered to be absent from the works footprint, although the species may potentially forage upon some of the site's fruiting trees (primarily limited to camphor laurel, privets and figs).<br>It is considered that the removal of several potential forage trees (primarily weed species) will not have a significant impact upon the species considering the abundance of surrounding connected bushland containing fruiting species (i.e. Mebbin National Park). |
| Marbled Frogmouth (*Podargus ocellatus*) | Unlikely | This species favours prefers subtropical or warm-temperate rainforest containing deep, wet, sheltered gullies dominated by stands of Bangalow Palms and/or dense rainforest understorey in SEQld and NENSW (DEC, 2005; Smith et al, 1994; Milledge, 1983). Tracking studies undertaken by Smith et al (1994) indicates that the species occupies a moderately large home range (8-10 hectares) which centres around a creek or gullyline although movements were greatly restricted during the breeding season. Roosts sites are in, or on the margins of, rainforest, frequently associated with vines (Smith *et al.*, 1998). | V | - | 9 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal.<br>The species has been previously recorded within the locality by the surveyor (pers obs.). Recorded locations comprised of densely vegetated gully lines. |
| Glossy Black-cockatoo (*Calyptorhynchus lathami*) | Unlikely | Glossy Black Cockatoos are uncommon parrots found in scattered localities in the forests and woodlands of eastern Australia and Kangaroo Island (Forshaw, 1981). The eastern subspecies of Glossy Black Cockatoos seems thinly distributed through its range with the highest densities occurring in south-eastern Queensland and north-eastern New South Wales (Forshaw, 1989). The main habitat of the eastern subspecies is *Eucalyptus* woodlands and forest with moderate-high densities of *Allocasuarina* which are required for feeding (Clout, 1989; Park & Borsboom, 1996; Forshaw & Cooper, 1989; Crome & Shields, 1992; Cleland & Sims, 1968; Garnett, 1992b; Blakers *et al*, 1984). Suitable senescent trees (large hollow within a live or dead Eucalypt: 10-20m, Depth: 40-120cm, Entry: ~21cm: Inside Dia: ~23cm (Forshaw, 1981; Gibbons & Lindenmayer, 2002)) are also required for nesting. | V | - | 4 | Favoured habitat for this species is considered to be absent from the works footprint given the absence of preferred feed trees (*Allocasuarina spp.*) and suitable sized hollows.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |
| Little Lorikeet (*Glossopsitta pusilla*) | Unlikely | The distribution of the Little Lorikeet extends from just north of Cairns, around the east coast of Australia, to Adelaide. In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri (Barrett *et al*. 2003). There is no evidence of regular migration, but Little Lorikeets are generally considered to be nomadic (Higgins 1999), with irregular large or small influxes of individuals occurring at any time of year, apparently related to food availability. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. In south-east Queensland (Smyth *et al*. 2002), Little Lorikeets were more likely to occupy forest sites with relatively short to intermediate logging rotations (15–23 years) and sites that have had short intervals (2.5– 4 years) between fires" (DECC, 2009). | V | - | 2 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal.<br>The species has been previously recorded ~2km northwest from the Study Area flying over Plantation areas (pers obs.). |
| Barking Owl (*Ninox connivens*) | Possible | The Barking Owl lives in forests and woodlands of tropical, temperate and semi-arid zones. Its habitat is typically dominated by eucalypts, often red gum species and, in the tropics, paperbarks *Melaleuca* species. It usually roosts in or under dense foliage in large trees including rainforest species of streamside gallery | V | - | 3 | Not recorded. Marginal foraging habitat present. Potential roost trees absent. |

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| | | forests, River She-oak *Casuarina cunninghamiana*, other *Casuarina* and *Allocasuarina* species, eucalypts, *Angophora* or *Acacia* species. Roost sites are often near watercourses or wetlands. It typically breeds in hollows of large eucalypts or paperbarks, usually near watercourses or wetlands. Barking Owls have been recorded in remnants of forest and woodland and in clumps of trees at farms, towns and golf courses. DECC (2005) notes that large home ranges of 30-200 hectares are occupied by the owl.<br>Although the site may fall within the species potential foraging range, the species was not recorded during survey efforts. Additionally, no suitable sized hollows were recorded within the study area. It is considered unlikely that the proposal will significantly impact the barking owl. | | | | This species is considered unlikely to be significantly affected by the proposal |
| Powerful Owl (*Ninox strenua*) | Possible | The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. | V | - | 4 | Although the site may fall within the species potential foraging range, the species was not recorded during survey efforts.<br>Additionally, no suitable sized hollows were recorded within the works footprint.<br>Given the small size of the proposal in comparison to the species range, it is considered unlikely that the proposal will significantly impact the powerful owl. |
| Masked Owl (*Tyto novaehollandiae*) | Possible | The Masked Owl lives in eucalypt forests and woodlands from the coast, where it is most abundant, to the western plains (Kavanagh 2002b in NPWS, 2005). Within suitable habitat that species occupies a range of 5-10km² where it forages mostly upon rodents and marsupials, although this may be supplemented by bandicoots, arboreal mammals (Sugar Glider, Common Ringtail Possum) and some birds with introduced rodents and rabbits becoming important in disturbed environments (Debus, 1993, Kavanagh, 1996; NPWS, 2005). Habitats containing stands of large, hollow bearing eucalypts are also critical to roosting and nesting (NPWS, 2005; Kavanagh and Murray, 1996). | V | - | 1 | Although the site may fall within the hunting range for the Masked Owl, it is unlikely to represent significant habitat within its home range given the small size of the works area (in comparison to the species home range). No suitable sized hollows were recorded within the works footprint.<br>Call playback and spotlighting failed to record the species during fauna surveys.<br>It is considered unlikely that the proposal will significantly impact the species. |
| Sooty Owl (*Tyto tenebricosa*) | Possible | This species is known predominantly from dry, subtropical and warm temperate rainforest and wet sclerophyll forest of the coastal, escarpment and eastern tablelands regions of NSW (Kavanagh 2002; DEC, 2005). The owl is reported as occupying the easternmost one-eighth of NSW (Debus 1994; DEC, 2005). Within this habitat it feeds largely on mammals ranging from small terrestrial species to medium sized arboreal species such as the Common Ringtail Possum, Sugar Glider, Bush Rat and Brown Antechinus (DEC, 2005; Lundie-Jenkins, 1992).<br>Nesting occurs in large hollow trees which are mostly Eucalypts but can include Moreton Bay Figs and Giant Stinging Trees (DEC, 2005). A very large home range has been estimated as "200-800 ha according to habitat productivity; measured as 3000 ha (1000 ha actually used) for one unmated, nonbreeding individual in marginal habitat, and 450+ ha for one adult female in continuous habitat of mesic gullies within dry forest (Kavanagh 1997, Kavanagh and Jackson 1997 in DEC, 2005: 12). Kavanagh & Stanton (2002) further note that small (<200 ha) fragments do not provide a significant reservoir for populations of large forest owl (Sooty, Powerful, Masked) species. | V | - | 11 | Similarly to the previously mentioned forest owls, the works footprint may fall within the hunting range for sooty owl. It is unlikely to represent significant habitat within its home range given the small size of the works area (in comparison to the species home range). No suitable sized hollows were recorded within the works footprint.<br>The species is known to occur within the locality and has been previously recorded by the surveyor within Mebbin National Park and surrounding large expansive forests (photo below). The species was however not recorded during survey efforts of the proposed works area.<br>It is considered unlikely that the proposal will have a significant impact upon this species. |

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| Albert's Lyrebird (*Menura alberti*) | Unlikely | This species is known from moist rainforest areas above 300m proximate to the NSW/QLD border which are characterized by an enclosed canopy, dense rainforest understorey and deep litter layer (Readers Digest, 2002; DECC, 2005; Garnett & Crowley, 2000). They favour areas with Antarctic Beech *Nothofagus moorei* and wet sclerophyll forest with a dense understorey of rainforest plants but are absent from some rainforest types, including complex notophyll vine forest on high nutrient soils (Gilmore, 2000) and from dry sclerophyll forest (Robinson and Curtis, 1996). They feed on invertebrates on the ground and have a clutch of one, laid in a large domed nest built in trees, on rock escarpments or on the steep sides of gullies (Higgins, in press) [in Garnett & Crowley, 2000]. | V | - | 4 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |
| Eastern Bristlebird (*Dasyornis brachypterus*) | Unlikely | The distribution of the Eastern Bristlebird has contracted to three disjunctive areas of south-eastern Australia: southern Queensland/northern NSW, the Illawarra Region and in the vicinity of the NSW/Victorian border. There are now only four populations in the southern Queensland/northern NSW area with a total of 35 birds, compared to 15 years ago when 14 populations and 154 birds were recorded (DECC, 2005; NPWS, 1999).<br>"The northern population of the eastern bristlebird lives in moist, mountain ranges within about 100 km of the coast. In Queensland most sightings have been within localised pockets of relatively open eucalypt forest in close proximity to denser vegetation along creek lines and rainforest. Soils are relatively fertile, derived from basalts of the Main Range Volcanics and Mt Warning Shield. However, a colony at Mt Barney lives in shrubby montane heath vegetation on poorer soils and a colony once occupied similar habitat near Surprise Rock in Lamington National Park.<br>The ground stratum of the eucalypt forests favoured by the eastern bristlebird is a mosaic of dense clumped grasses interspersed with patches of shrubs, ferns, tangled vines and fallen logs. The more common grasses include wild sorghum (Sarga leiocladum), kangaroo grass (Themeda triandra) and tussock grass (Poa labillardieri). The presence of mature wild sorghum tussocks is thought to be a good indicator of high quality bristlebird habitat. Breeding pairs establish permanent territories of 1-4 ha with calling birds 100-300 m apart." (DERM, 2009 online @ http://www.derm.qld.gov.au/wildlifecosystems/wildlife/threatened_plants_and_animals/endangered/eastern_bristlebird.html).<br>Age of habitat since fires (fire-age) is of paramount importance to this species although the time since previous fire and the ability with which individuals are able to re-establish within burnt areas varies between populations (DECC, 2005; Bain et al, 2008).<br>From various studies, Baker (2003) concluded that fire was implicated in the extinction of at least 12 populations of eastern bristlebirds in the last three decades. Fire temporarily removes dense understorey vegetation, which is a critical component of the preferred habitat of the eastern bristlebird. Being semi flightless and cover-dependent, the eastern bristlebird is not expected to be able to colonise new areas readily or to recolonise areas after disturbances (Smith 1977; Baker 2000) and may also expose the species to higher mortality during fires (in Bain et al, 2008: 45). | E | E | 1 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |

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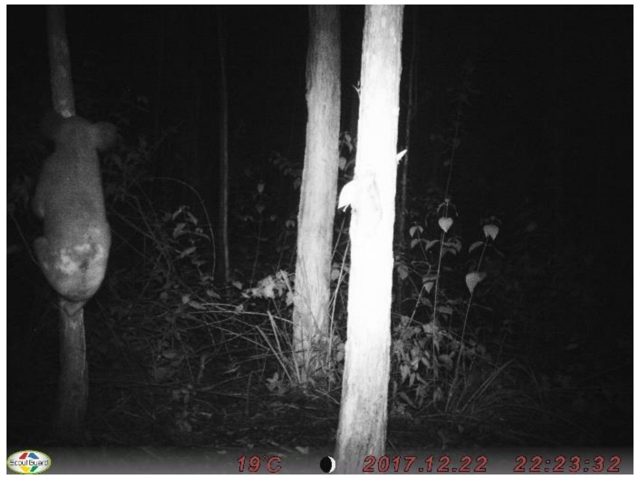
| Grey Crowned Babbler (*Pomatostomus temporalis temporalis*) | Unlikely | The Grey-crowned Babbler occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. In NSW, the species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands.<br>Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains, in addition to woodlands on fertile soils in coastal regions. | V | - | 1 | Preferred habitat and location (western slopes of the Great Dividing Range) does not occur within the site and the species was not recorded during fauna survey efforts.<br>It is considered unlikely that the proposal will have a significant impact upon this species. |
| Barred Cuckoo-shrike (*Coracina lineata*) | Unlikely | This species has been recorded from a variety of habitats including rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses within Coastal NSW (NPWS, 2002). Foraging requirements include fruiting tree species within in rainforest, wet sclerophyll forest, vegetation remnants or isolated trees (DEC, 2005) and insects captured among foliage (NPWS, 2002). | V | - | 3 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |
| White-eared Monarch (*Carterornis leucotis*) | Potential | This species generally occurs within Coastal/Subtropical/Littoral Rainforests and occasionally Eucalypt/Riparian Forest, Mangroves and Swamp Sclerophyll with mesomorphic understorey along the eastern coast of Australia from Cape York to the Tweed River (Readers Digest, 2002; DEC, 2005). In NSW, White-eared Monarchs occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest.<br>• They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads.<br>• They are highly active when foraging, characteristically sallying, hovering and fluttering around the outer foliage of rainforest trees. They are usually observed high in the canopy or subcanopy | V | - | 15 | Marginal potential habitat occurs for the species in association with forested areas of the site, although the species was not recorded during survey efforts.<br>Given the small size of the proposal in comparison to the species range, it is considered unlikely that the proposal will significantly impact the white-eared monarch. |
| Scarlet Robin (*Petroica boodang*) | Unlikely | 'The Scarlet Robin breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. It forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris. The Scarlet Robin builds an open cup nest of plant fibres and cobwebs, sited in the fork of tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground (Higgins and Peter 2002; Debus 2006a,b). Generation length is estimated as 5 years based on the congeneric Flame Robin (Garnett and Crowley 2000)' [DECC online @ http://www.environment.nsw.gov.au/determinations/scarletrobinFD.htm]. | V | - | 4 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |
| Spotted-tailed Quoll (*Dasyurus maculatus*) | Unlikely | The species has been recorded from a wide range of habitats such as rainforest, open forest, woodland, coastal heathland, and inland riparian forest (Edgar and Belcher, 2002; Forest Practices Board, 2002). Additional habitat requirements include suitable den sites (such as hollow logs, tree hollows, rock outcrops or caves) and an abundance of food (such as birds and small mammals) (NSWNPWS, 1999; Edgar & Belcher, 2001; Belcher, 2000; Jones & Ross, 1996). Habitat range for males has been estimated to be as large as 2000-2200 hectares per individual, while for females, which are more protective of their dens, this value is considerably less at between 700-850 hectares per individual (Belcher, 2000; NPWS, 1999). In addition, Quolls are known to frequently swap dens and disperse large distances on any one night.<br>Whilst potential habitat is present in the form of rainforests containing an rocky outcrops and gullies plus fallen debris including logs it is considered that the residual patches of potential habitat are too small to support a population of the species and isolated from similar habitats (numerous dispersal barriers including development, farmland, swamps/creeks etc.). The recent and previous survey efforts failed to yield any evidence of quoll activity on the site. Nevertheless, all areas of potential quoll habitat will be retained. It is considered unlikely that the proposal will significantly impact the species. | V | E | 2 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |
| Common Planigale (*Planigale maculata*) | Unlikely | This species is known to 'inhabit a broad range of habitats incorporating a dense ground cover layer including rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas (Redhead in Strahan, 2002; Lewis, 2005). In northern NSW, it has been suggested that their distribution often corresponds with the low lying flat and undulating areas of the coastal plains often near intensively settled areas (Gilmore and Parnaby 1994 in Lewis, 2005). A small population of the species has been recently recorded on the northern banks of the Cobaki Broadwater in association with Swamp Mahogany/Brushbox Forest (Ecopro, 2004; Lewis Ecological Surveys, 2004). A population of Planigales is also known further south of the site within the Koala Beach development where the species has been recorded within Brushbox Forest, Tall Eucalypt dominated Wet Sclerophyll Forest, Swamp Forest, Regrowth Eucalypt Forest and utilising artificial habitats within | V | - | 1 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |

<table>
<tr><td></td><td></td><td>recorded habitats (AKF, 2005; TSC, 2007). Habitat features that appear most important to the local Planigale population include:<br>i) Dense or scattered tree canopy-cover;<br>ii) Dense ground-cover vegetation; and<br>iii) Areas within or adjacent to low-lying sites subject to seasonally wet conditions, with occasional inundation for short periods (AKF, 2005).</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Koala (*Phascolarctos cinereus*)</td><td>Unlikely</td><td>This species primarily occurs within Eucalypt Forest and Woodlands containing a suitable density of favoured food trees within coastal eastern and southeastern Australia. Preferred habitat generally contains a high percentage of primary food trees although underlying geology and soil type can be an important factor. Eucalypt Forests associated with drainage lines and floodplains of richer soil types (i.e. moisture and nutrients) can also be favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell & Lee, 1990; Moore & Foley, 2000).<br><br>Within SEQLD six primary foraging trees were identified by Pahl (1993); Tallowwood (*Eucalyptus microcorys*), Forest Red Gum (*E. tereticornis*), Scribbly Gum (*E. racemosa*), Grey Gum (*E. propinqua*), Red Mahogany (*E. resinifera*) and White Stringybark (*E. tindaliae*). Further research undertaken by Phillips & Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (*E. robusta*) and Blue Gum (*E. tereticornis*) [including hybrids of the two] on alluvial deposits and Quaternary and Neranleigh-Fernvale Group geomorphologies were considered to be primary habitats. Areas with sub-dominance of these species on Neranleigh-Fernvale alliances supporting Blue Gum (*E. tereticornis*), Tallowwood (*E. microcorys*) and/or Grey Gum (*E. propinqua*) comprise secondary habitat or primary habitat depending on the density of the latter two species. Phillips & Callaghan (1998) also noted Tallowwood to be a primary browse species and two types of Grey Gum (*E. propinqua, E. biturbinata)* to be secondary browse species in Currumbin.<br><br>Recent studies (Biolink, 2007) indicate that *Eucalyptus tereticornis, E. microcorys* and *E. propinqua/E. biturbinata* are the most preferred koala food trees throughout the Gold Coast LGA.<br>Within the Tweed Coast Swamp Mahogany *Eucalyptus robusta* and Forest Red Gum *E. tereticornis* are the most preferred tree species with Tallowwood *E. microcorys* and Grey Gum *E. propinqua* being the next most preferred (Biolink, 2011).<br><br>Recent studies (Biolink, 2012) notes Swamp Mahogany (*E. robusta*), Forest Red Gum (*E. tereticornis*) and Tallowwood (*Eucalyptus microcorys*) being primary food tree species with Grey Gum (*E. propinqua*) being a secondary food tree species within Byron Shire.<br><br>Within utilized Eucalypt Forest habitat the koala spends most of its time in distinct home-ranges which may overlap if available habitat area is reduced. Males are territorial but a dominance-hierarchy exists, and they may attack during the summer breeding season. Home ranges of the species are considered to be large and can vary dependent upon habitat quality and extent. Studies have shown various home range sizes exist with the males usually larger than the female (Male 135ha, Female: 110ha [Ellis et al, 2002], Male: 34.4ha, Female: 15ha [White, 1999]).<br><br>A review of a number of published scientific reports notes that Koala density generally ranges between 0.02 and 1.26 animals per hectare. Densities are considered to vary dependent upon habitat quality, size, connectivity, presence of impediments to movement (stock fences, dogs, roads etc).<br><br>
<table>
<tr><th>Source</th><th>Study Location</th><th>Habitat Type</th><th>Additional Comments</th><th>Koala/ha</th></tr>
<tr><td>Dique et al, 2003</td><td>Southeast QLD Pine Rivers Shire</td><td>Tall shrubby open forest (Tertiary surfaces) and Tall open forest upon metamorphics</td><td>Stratified by two habitat descriptions ‘urban’ and ‘bushland’</td><td>0-0.76</td></tr>
</table>
</td><td>V</td><td>V</td><td>80</td><td>Favoured habitat for this species is considered to be absent from the works footprint.<br><br>No koalas were recorded during the survey via diurnal searches, nocturnal spotlighting, amplified call playback or trunk basal searches for scats. Additionally, no scratch marks indicative of a koala was observed on smooth barked trees.<br><br>The species is known to occur within the remnant eucalypt forests of the locality and has been recorded by the surveyor on several occasions (photo below).<br><br>The proposal does not seek to remove any koala habitat or forage trees, nor introduce any barriers or predator species (i.e. dogs).<br><br>This species is considered unlikely to be significantly affected by the proposal.<br><br> </td></tr>
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| Dique et al, 2004 | Southeast QLD Koala Coast ~375sqm of Redland, Logan and Brisbane City shires | Eucalypt Forests. Predominately RE 12.9-10.4 & 12.11.5 | Study stratified by habitat descriptions: 'urban', 'remnant bushland', 'bushland' and 'other'. Remnant and bushland areas further stratified by proximity to the centre of the study area (high density=close to centre, low density=further away) | Range 0.02-1.26<br>Urban: 0.17 +/-0.013<br>High remnant: 0.70 +/-0.023<br>Low remnant: 0.20 +-/0.014<br>High bushland: 0.30+/-0.006<br>Low bushland: 0.11 +/-0.007<br>Other: 0 |
| White and Kunst 1990 | Southeast QLD Sheldon | Eucalypt Forest |  | 0.4 (0.3-0.46) |
| Sullivan et a 2004 | Southwest QLD | Eucalypt Forest/woodland within the mulgalands | Habitat stratified by floristics and landzone. | 0.0007-2.513 |
| Biolink 2007 | Coombabah Koala Habitat Area | Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts | Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per *Dique, 2003; EPA, 2005.* | 0.22+/-0.04 |
| Biolink 2007 | Coomera-Pimpama Koala Habitat Area | Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts | Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per *Dique, 2003; EPA, 2005.* | 0.23+/-0.03 |

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| Yellow-bellied Glider (*Petaurus australis*) | Unlikely | In NSW, distribution of the Yellow-bellied Glider is essentially coastal, extending inland to adjacent ranges (NSW NPWS 2003). It typically occurs in tall, mature eucalypt forest in regions of high rainfall, but is also known to occur in drier areas (Carthew et al 1999). It inhabits a wide range of forest types but prefers resource-rich forests where mature trees provide nesting hollows and tree species composition provides year-round continuity of food resources (Craig 1985; Kavanagh 1987a; Goldingay and Kavanagh 1999).<br>In north-eastern NSW, preferred habitat is described as either mixed sclerophyll forests of the coastal plains, sub-coastal mid- to high-elevation forests and moist and dry escarpment forests (Gilmore and Parnaby 1994) or dry sclerophyll forests with a grassy or xeric understorey (Mackowski 1986). | V | - | 2 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal.<br>The species has been previously recorded by the surveyor within remnant flooded gum forests of Mebbin National Park. |
| Squirrel Glider (*Petaurus norfolcensis*) | Possible | This species of Glider is associated with dry sclerophyll forest and woodlands although in northern NSW and Qld it has been recorded from wet sclerophyll environments (Suckling in Strahan eds, 2002; Lindenmayer 2002). It is considered to be most abundant in associations containing winter flowering Eucalypts and/or | V | - | 1 | Marginal potential habitat occurs onsite for the species in the forms of flowering species (i.e. wattles, grevilleas), |

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| | | environments with a high abundance of Acacia, Banksia species in the lower layers (Smith & Murray, 2003; Menkhorst et al, 1998; Quinn, 1995).<br>Within the canopy of the preferred habitat numerous trees bearing hollows are critical habitat values required to support populations of the species (Quinn, 1995; Smith & Murray, 2003; Lindenmayer, 2002). Gliders are known to regularly swap den trees and utilise a number of such dens (between 6 and 19 den trees per Glider) within their home range (van der Ree, 2000). These results are supported by survey work undertaken by Southern Cross University (June/July 2002) which indicated that 12 radio tracked gliders utilised 37 den trees incorporating live hollow bearing trees and stags (Cited in Warren, 2004). | | | | although the absence of suitable hollow bearing trees from the site and immediate surrounding areas. Amplified call playback and spotlighting failed to record the Squirrel Glider occurring within the site.<br>Given the small size of the proposal in comparison to the available resources within the locality, it is considered unlikely that the proposal will significantly impact the squirrel glider.<br>The species is known to occur within the locality and has been recorded on several occasions within surrounding remnant eucalypt forests containing an abundance of hollows. |
| Grey-headed Flying Fox (*Pteropus poliocephalus*) | **Recorded** | The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000). | V | V | 6 | All forested areas of the site represent potential foraging habitat for this species.<br>The species was recorded flying over the site at dusk.<br>No evidence of roosting on the site was observed with the nearest known flying-fox roost camp occurring ~11km northeast of the site within Uki (DoEE, 2019).<br>As the proposal does not interfere with any roost camps, and does not remove significant areas of foraging resources, it is considered unlikely that the proposal will have a significant impact upon the species.<br>Nevertheless, a 'Test of Significance' as been conducted for this species. |
| Brush-tailed Rock Wallaby (*Petrogale penicillata*) | Unlikely | The Brush-tailed Rock Wallaby occurs in a variety of habitats, ranging from rainforest to sclerophyll forest and open woodland (Eldridge & Close 1995). These habitats must support complex rocky outcrops with numerous ledges, caves, overhangs and crevices are preferred as these provide a variety of shelter and rest sites (Short 1982; Eldridge & Close 1995; Moss *et al*. 1999). Sunny, north facing sites are also preferred (Short 1982). Brush-tailed Rock Wallabies remain in the shelter and safety of refuges for much of the day, emerging to feed during the evening, usually within 200m of the refuge site (Jarman & Bayne 1997). This species feeds predominantly on grasses and forbs and the foliage of shrubs and trees (Short, 1989). Seeds and fruits are eaten on a seasonal basis (Short, 1989). Studies undertaken by Carter and Goldizen (2003) indicated that the wallaby selects foraging locations on the basis of forage quality and/or their ability to see predators, rather than protection from predators amongst vegetation that could conceal them (Carter and Goldizen, 2003). | E | V | 1 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal. |
| Red-legged Pademelon (*Thylogale stigmatica*) | Unlikely | This species of pademelon is patchily distributed along coastal and subcoastal eastern Australia from Cape York to the Hunter Valley in NSW. Southern range records are from the Watagan Mountains and the Wyong district. There are unconfirmed records from the western New England Tablelands (e.g. west of Emmaville). Within its recorded range the species inhabits forest with a dense understorey and ground cover, including rainforest, moist eucalypt forest and vine scrub. In NSW they are rarely found outside forested habitat and disperse from dense shelter areas to feed from late afternoon to early morning, favouring native grasses and herbs on the edge of the forest (DECC, 2005 online @ http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10805). | V | - | 11 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal.<br>The species has been previously recorded by the surveyor in the locality within wet sclerophyll forests containing a dense understorey. |
| Eastern Coastal Freetail-bat (*Micronomus norfolkensis*) | Unlikely | This species has been recorded in dry eucalypt forest and coastal woodlands but individuals have been captured in riparian zones in rainforest and wet sclerophyll forest and mangrove forests east of the Great Dividing Range (Allison and Hoye, 1995; DEC, 2005). An extensive study near Coffs Harbour found it to be more active on the upper slopes where flyways are large than along creeklines (Hoye, Law and Allison in Van Dyck and Strahan, 2008). The species forages upon insects above the forest canopy or at forest edges (Allison, 1983). It is known to roost in tree hollow, particularly in hollow spouts, but occasionally found in buildings (Gilmore and Parnaby, 1994; Allison and Hoye, 1995; DEC, 2005). Recent studies performed by McConville et al (2013) indicate that mangrove habitats may also provide important roost sites. | V | - | 2 | Favoured habitat for this species is considered to be absent from the works footprint.<br>No potential roosting sites were recorded within the works envelope. |

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| | | | | | | This species is considered unlikely to be significantly affected by the proposal.<br>The species has previously been recorded via anabat surveys within expansive forested areas north of the works envelope (Planit 2017-2018). |
| Little Bentwing-bat (*Miniopterus australis*) | Possible | This species utilises well-timbered habitats including rainforest, *Melaleuca* swamps and dry sclerophyll forests where it It feeds on insects within the canopy and requires caves, mines, stormwater drains and/or tree hollows to roost (Strahan eds, 2002). DECC (2005) note the following additional particulars with regard to the little bentwing bat:<br>• Maternity colonies form in spring. Males and juveniles disperse in summer.<br>• Only five nursery sites /maternity colonies are known in Australia.<br>• Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.<br>• Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.<br>• They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.<br>• In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (*M. schreibersii*) and appears to depend on the large colony to provide the high temperatures needed to rear its young. | V | - | 5 | Although well-timbered areas are considered to be absent from the subject site, marginal potential habitat occurs in association with vegetated areas of the site, although is not considered important for the species given its small size and abundance of similar habitats within the locality.<br>No potential roosting sites were recorded within the works envelope.<br>Modification of an insignificant area of potential foraging habitat will occur. This species is considered unlikely to be significantly affected by the proposal.<br>The species is regularly recorded within the region (pers obs.) and has previously been recorded within expansive forested areas north of the works envelope, via anabat surveys (Planit 2017-2018). |
| Large Bentwing-bat (*Miniopterus orianae oceanensis*) | Possible | This species usually forages on insects within intact, well timbered forest complexes and have been found to roost within caves, tunnels, stormwater culverts or disused mining areas (Strahan eds, 2002; DEH, 2005). They utilize a broad range of habits including wet and dry sclerophyll forest, open woodland, paperbark forests, rainforests and open grasslands (North & Pasic, 2006). Twelve known maternity roost sites occur within its distribution ranging from tens of thousands to >100000 individuals. The known large roost sites are located in limestone and sandstone caves, abandoned gold mines, concrete bunkers and lava tubes. Outside the breeding season the eastern bentwing often selects cool areas within caves, mines, tunnels, drains and bridges (Hoye & Hall in Van Dyck & Strahan, 2008). | V | - | 1 | Although well-timbered areas are considered to be absent from the subject site, marginal potential habitat occurs in association with vegetated areas of the site, although is not considered important for the species given its small size and abundance of similar habitats within the locality.<br>No potential roosting sites were recorded within the works envelope.<br>Marginal potential foraging habitat removed. This species is considered unlikely to be significantly affected by the proposal.<br>The species has previously been recorded via anabat surveys within expansive forested areas north of the works envelope (Planit 2017-2018). |
| Large-eared Pied Bat (*Chalinolobus dwyeri*) | Unlikely | The Large-eared Pied Bat occurs within drier habitats, including dry sclerophyll forests and woodlands (Hoye and Schulz in Van Dyck and Strahan, 2008) although it has been recorded within a range of habitats, including wet and dry sclerophyll forest, Cyprus pine dominated forest, tall open eucalypt forest with a rainforest sub-canopy, sub-alpine woodland, but typically in association with sandstone relief.<br>Much of the known distribution is within NSW. Available records suggest that the largest concentrations of populations appear to be in the sandstone escarpments of the Sydney basin and the north-west slopes (Coolah Tops, Mt Kaputar, Warrumbungle National Park (NP) and Pilliga Nature Reserve (NR). Although the species is widely distributed, it is uncommon and patchy within this area. Sightings of note include Tottenham, west of Narromine (NSW), which is the furthest west record (Shelly 2001); Swansea Open Cut Mine area of the Wallarah Peninsula, north coast NSW (Conacher Travers 2006); a disused gold mine near Barraba (NSW) that included lactating females and dependent young (Spark 2011 pers. comm. cited in Qld DERM 2011); and Moreton NP (NSW) at the southern end of the species' range (Hoye 2005).<br>'Little is known about the habitat and roosting requirements of the Large-eared Pied Bat, but natural roosts may depend heavily on sandstone outcrops. It has been found roosting in disused mine shafts, caves, overhangs and disused Fairy Martin (*Hirundo ariel*) nests for shelter and to raise young (Hoye & Dwyer 1995; Schulz 1998). | V | V | 1 | Favoured habitat for this species is considered to be absent from the works footprint.<br>No potential roosting sites were recorded within the works envelope.<br>This species is considered unlikely to be significantly affected by the proposal.<br>The species has previously been recorded via anabat surveys within expansive forested areas north of the works envelope (Planit 2017-2018). |

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| Hoary Wattled Bat (*Chalinolobus nigrogriseus*) | Possible | In NSW the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat (DEH, 2012 online @ http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10158). This species is a continuous flight forager that primarily searches for a variety of insects close above the canopy and within openings in forested habitat (Fenton 1982, Allison 1995, Churchill 1998). It also forages over open ground adjacent to forested habitat (McKenzie and Rolfe 1986). The presence of insects, such as wingless ants, in scats suggests that some gleaning off foliage and other surfaces occurs (Vestjens and Hall 1977, Allison 1995) in Lumsden et al, 2005: 131). Roosting has been recorded in tree hollows and rock crevices (Kutt et al in Van Dyck and Strahn, 2008). | V | - | 1 | Favoured habitat for this species is considered to be absent from the works footprint.<br>No potential roosting sites were recorded within the works envelope.<br>This species is considered unlikely to be significantly affected by the proposal.<br>The species has previously been recorded via anabat surveys within expansive forested areas north of the works envelope (Planit 2017-2018). |
| Southern Myotis (*Myotis macropus*) | Possible | The Myotis roosts within caves, tunnels, hollow-bearing trees, bridges, buildings and dense tree foliage always in close proximity to permanent water (NPWS, 2002; Richards, 2002). Breeding colonies may consist of 10-15 individuals or occasionally up to several hundred. Within breeding colonies small clusters are made where a male establishes a territory from which other males are actively excluded and breeding females are protected. Outside of breeding males roost solitarily within a defended zone or established a small group of up to 20 males. | V | - | 5 | The ephemeral drainage line may provide potential foraging habitat for the species during ponding periods.<br>No potential roosting sites were recorded within the works envelope.<br>Modification of an insignificant area of potential foraging habitat will occur. This species is considered unlikely to be significantly affected by the proposal.<br>The species has previously been recorded via anabat surveys proximate to waterbodies north of the works envelope (Planit 2017-2018). |
| Eastern Long-eared Bat (*Nyctophilus bifax*) | Unlikely | This species of bat inhabits lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest with coastal rainforest and patches of coastal scrub particularly favoured (DEC, 2005; NPWS, 2002). Roosting occurs within tree-hollows, under bark and/or palm fronds and within dense foliage with a seasonal shift in roost sites from rainforest edges (summer) to the rainforest interior (winter) (NPWS, 2002; Parnaby in Strahan, 2002; Lunney et al, 1995). | V | - | 3 | Favoured habitat for this species is considered to be absent from the works footprint.<br>No potential roosting sites were recorded within the works envelope.<br>The species was not recorded during survey efforts of the site. This species is considered unlikely to be significantly affected by the proposal.<br>A *Nyctophilus spp*. has previously been recorded via anabat surveys within expansive forested areas north of the works envelope (Planit 2017-2018). |
| Greater Broad-nosed Bat (*Scoteanax rueppellii*) | Unlikely | This species of bat favours the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland but also extends to the coast over much of its range (DEC, 2005, Hoye & Richards in Strahan eds, 2002). Within this range it favours tall wet forest including creek/river corridors although it will also utilise a variety of other habitats such ranging from dry eucalypt woodlands to rainforest (DEC, 2005, Hoye & Richards in Strahan eds, 2002). This species is noted to favour roosts within tree hollows although it has also been recorded within buildings (DEC, 2005, Hoye & Richards in Strahan eds, 2002). Radiotracking within Bundjalung National Park noted the species to roost exclusively within Melaleuca quinquenervia (Campbell, 2001). | V | - | 1 | Although well-timbered areas are considered to be absent from the subject site, marginal potential habitat occurs in association with vegetated areas of the site proximate to Tweed River and drainage lines, although is not considered important for the species given its small size and abundance of similar habitats within the locality.<br>No potential roosting sites were recorded within the works envelope.<br>Modification of an insignificant area of potential foraging habitat will occur. This species is considered unlikely to be significantly affected by the proposal.<br>The species has previously been recorded via anabat survey within expansive forested areas north of the works envelope (Planit 2017-2018). |
| Eastern Cave Bat (*Vespadelus troughtoni*) | Unlikely | The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW (OEH. 2019b). | V | - | 1 | Favoured habitat for this species is considered to be absent from the works footprint. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals (OEH, 2018). Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behavior (OEH. 2019b). | | | | No potential roosting sites were recorded within the works envelope.<br>This species is considered unlikely to be significantly affected by the proposal.<br>The species has previously been recorded via anabat survey within expansive forested areas north of the works envelope (Planit 2017-2018). |
| Southern Pink Underwing Moth (*Phyllodes imperialis southern subspecies*) | Unlikely | *Phyllodes imperialis* southern ssp. ANIC 3333 is distributed from Nambour, south-east Queensland, to Dorrigo in northern NSW (Clarke & Spier-Ashcroft, 2003). It is currently known from five locations of which Mary Cairncross Scenic Reserve near Maleny (Queensland) contains the only confirmed breeding habitat (NSW Scientific Committee, 2003). In Australia, the northern subspecies of P. imperialis occurs in rainforest in northeastern Queensland. Other subspecies occur in Papua-New Guinea, Solomon Islands, Vanuatu and New Caledonia. This subspecies occurs within the Burnett Mary and South East (Queensland) and Northern Rivers (NSW) Natural Resource Management Regions. The subspecies occurs below altitudes of 600 m in undisturbed subtropical rainforest in association with the vine *Carronia multisepalea*. | E1 | - | 2 | Favoured habitat for this species is considered to be absent from the works footprint.<br>The species was not recorded during survey efforts of the site. Additionally, *Carronia multisepalea* was not recorded during flora surveys of the site. This species is considered unlikely to be significantly affected by the proposal. |

*Note: E1 = Endangered (BCA, 2016); E = Endangered (EPBC 1999); E4A = Critically Endangered (BCA, 2016); CE = Critically Endangered (EPBC 1999); and V = Vulnerable (BCA, 2016 and EPBC 1999)*

## 5.4 Areas of Outstanding Biodiversity Value

Areas of Outstanding Biodiversity Value (AOBV) listed under the *Biodiversity Conservation Act 2016* include:

- Wollemia nobilis (the Wollemi pine)
- Little penguin population in Sydney's North Harbour

The proposal will not impact upon any of these AOBV.

## 5.5 Wetlands and Waterways

Reviewing Council's Mapping (**Figure 10**), a 'Drainage Line' traverses the proposal footprint in a north to south direction which splits into two separate drainage lines at Kyogle Road. These drainage lines connect to the Tweed River which occurs along the northern boundary of the proposal footprint.

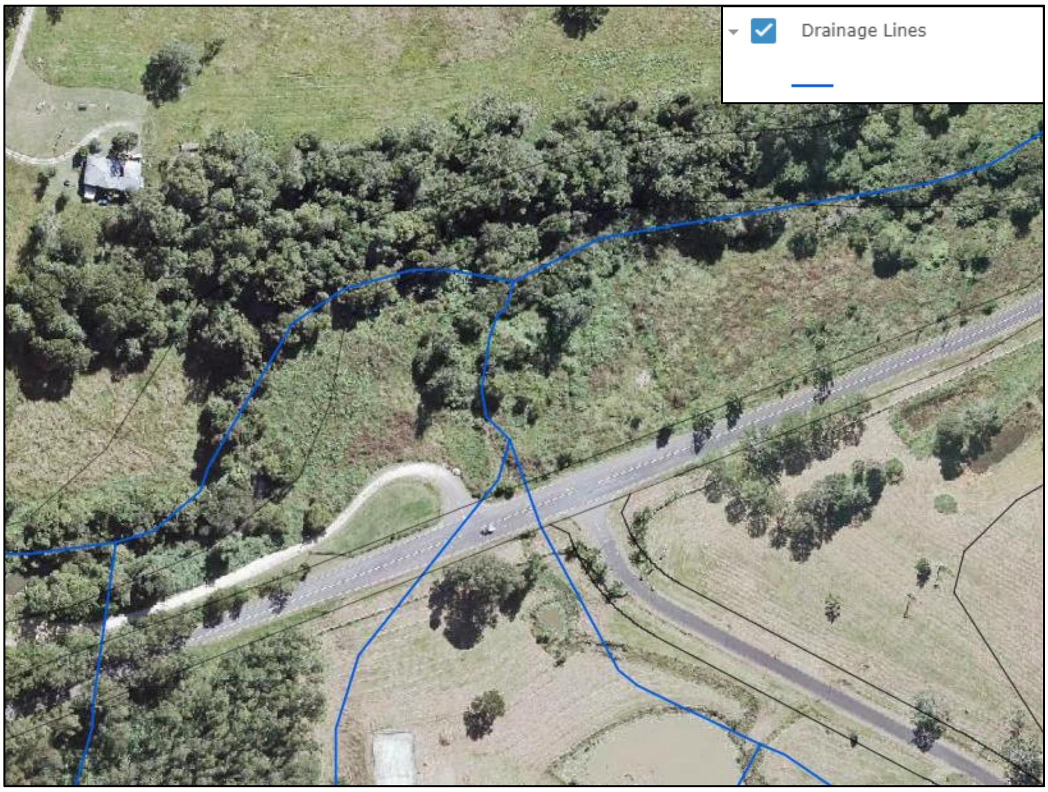


**Figure 10: Tweed Shire Council Drainage Line Mapping (Online @ http://tweedsc.maps.arcgis.com/apps/webappviewer/index.html)**

As previously discussed, areas associated with these onsite drainage lines are highly modified, disturbed and infested with exotic species.

These 'drainage lines' will be retained as a part of the proposal. Culverts are proposed to ensure flow is maintained during ponding periods.

It is recommended that strict sediment and erosion control measures are implemented during the construction phase of the proposal to ensure no downstream impacts arise.

*Mapped 'Drainage Line' Within the Works Area*

*Mapped 'Drainage Line' Within the Works Area*

No wetland type habitat was recorded within the works footprint during site inspection. Additionally, the site is not mapped as containing Coastal Wetlands under SEPP (Coastal Management) 2018.

## 5.6 Fauna Corridors and Linkage

Wildlife corridors can be defined as 'retained and/or restored systems of (linear) habitat which, at a minimum enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation' (Wilson & Lindenmayer, 1995). Corridors can assist ecological functioning at a variety of spatial and temporal scales from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions (Parsons Brinkerhoff, 2005).

Corridors serve a number of different functions in terms of biodiversity conservation including:

- providing increased foraging area for wide-ranging species;
- providing cover for movement between habitat patches, particularly for cover dependent species and species with poor dispersal ability and enhancing the movement of animals through sub-optimal habitats;
- reducing genetic isolation by maintaining continuity between sub-populations in a metapopulation and thereby preventing and /or reversing localised extinction;
- facilitating access to a mix of habitats and successional stages to those species which require them for different activities (for example, foraging or breeding);
- providing refuge from disturbances such as fire;
- providing habitat in itself (Wilson, A. & Lindenmayer 1995; Lindenmayer, 1994; Bennett, 1999).

How species use the corridor network will depend largely on the home and activity ranges of the species, their habitat requirements and the ecological characteristics of the corridor. For example, some large or mobile species may make direct movements through the corridor network, moving from one patch of habitat to another. These direct movements may be on the scale of a foraging expedition or a migration (Bennett 1990b). Other species may have movements by single individuals punctuated by pauses in the corridor, which can last anything from a small foraging or resting bout to weeks and even months. If the corridor contains sufficient resources to maintain a population, then continuity through the corridor may be through gene flow through the resident population (Bennett 1990b; Wilson, A. & Lindenmayer 1995).

For example, a mobile species with a large home range (i.e. koala) may regularly traverse a corridor to move between favoured feeding grounds or in attempt to access mates, whereas a species with a comparably minor home range (i.e. antechinus) may spend its entire life within a portion of the same corridor.

It is noted that the site is not nominated as occurring within a 'regional' or 'subregional' corridor on TSC mapping (refer **Figure 11**). A review of the modified residual and fragmented habitats indicates that the site is not likely to perform a significant terrestrial dispersal function and as such it is considered unlikely that the proposal would create any significant dispersal barriers for terrestrial fauna species.

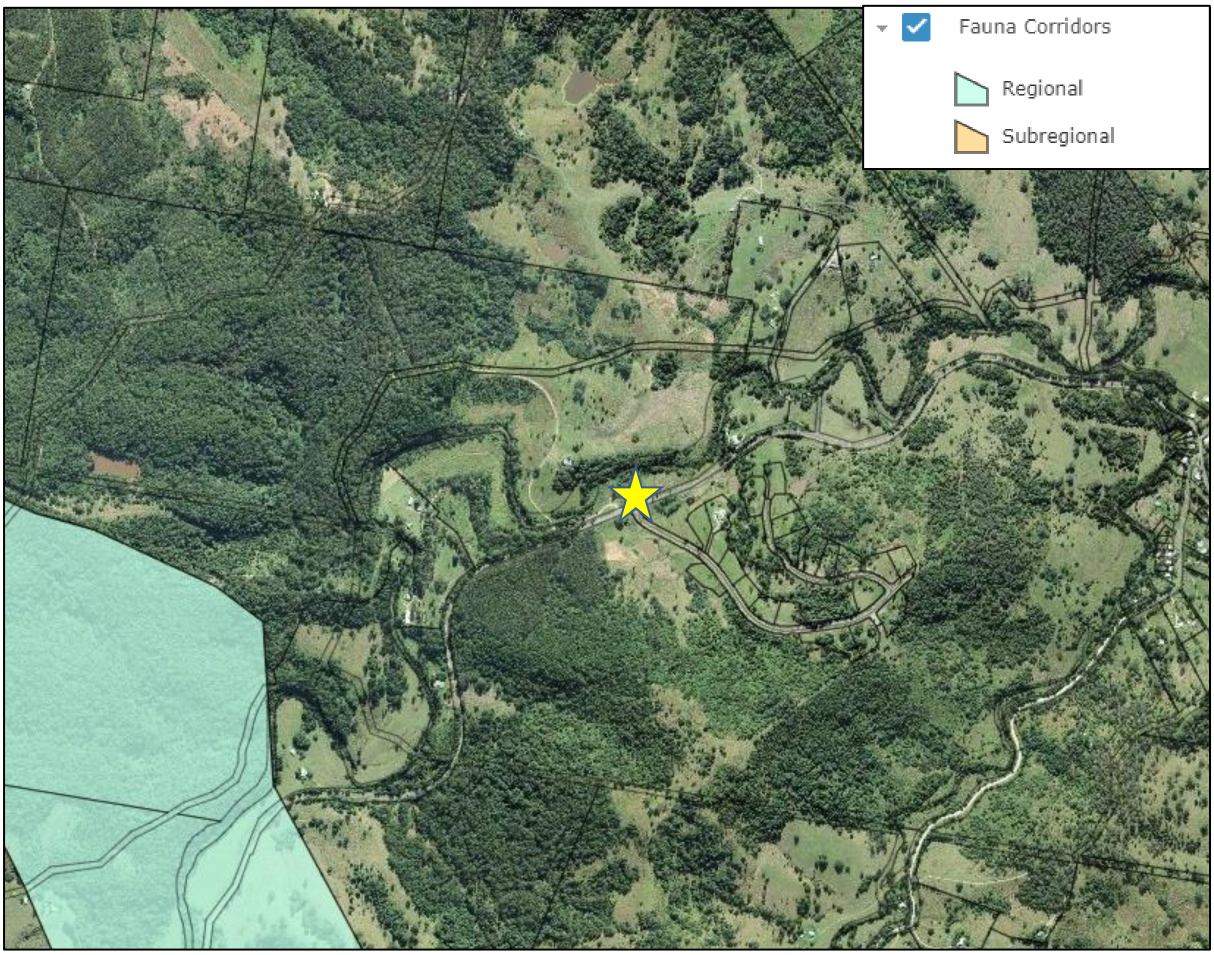


**Figure 11: Tweed Shire Council Fauna Corridor Mapping (Online @ http://tweedsc.maps.arcgis.com/apps/webappviewer/index.html)**

Large-scale local fauna movement occurs in association with the surrounding forested areas of the subject site and other protected areas of the locality (i.e. Mebbin National Park, Nightcap National Park, Wollumbin National Park etc.). It is considered that this corridor is sufficient in size to retain fauna movement opportunities between local habitats.

## 5.7 Other Ecologically Significant Features

### 5.7.1 Hollow Bearing Trees

The loss of hollow bearing trees has been identified as the most significant cause of biodiversity reduction in timber production forests of eastern Australia (Smith *et al*, 1994) with the subsequent adequate management of the hollow tree resource being critical to achieving Commonwealth and State conservation objectives (National Forest Policy Statement, 1992; Nature Conservation Act, 1992). Gibbons and Lindenmayer (2002) estimate that 303 native vertebrate species utilize tree hollows of which approximately 100 are listed as rare or threatened within State or Commonwealth Legislation. Research conducted by the Department of Natural Resources (1998) estimates that 134 of these species potentially utilize tree hollows in SE Queensland. Given that hollow bearing potential is low for Eucalypts below 120-180 years of age (with older trees required for larger fauna) and the fact that many species require a variety of different hollows within their home range (particularly arboreal mammals), hollow bearing trees represent a limited ecological resource (Gibbons & Lindenmayer, 2002; DNR, 1998-1999; Strahan, 2002; Ball, Lindenmayer & Possingham, 1999).

In regards to the proposal, no hollow bearing trees or tree containing nest boxes will be required to be removed.

# 6 STATUTORY CONSIDERATIONS – TEST OF SIGNIFICANCE (SECTION 7.3 OF THE BIODIVERSITY CONSERVATION ACT 2016)

Further to the provisions of Section 7.3 of the *Biodiversity Conservation Act* 2016, the 'test of significance' is applied to assess any potentially adverse impacts of the site-proposal on threatened species, populations and/or communities occurring within the site or surrounding locality.

Note that threatened species, populations and/or communities have been excluded from this assessment where:

- No direct observations of threatened species, populations or communities were made on the site during survey works;
- No previous sightings of threatened species, populations or communities within a 10-kilometre radius of the site have been registered within the Bionet database and scheduled under the *Biodiversity Conservation Act 2016*;
- An abundance of primary habitat requirements for said species are not located on or within the locality of the proposal (refer previous sections); and
- Potential habitat (feeding, roosting, nesting or refuge) will not be or will be minimally affected by the proposal (refer previous sections).

As such it is considered that, of the scheduled species, populations and/or communities described previously within this report, the following threatened species were recorded on the site (or nearby) and may have the potential to be significantly affected through any development of the site.

**Table 6: Threatened Species, Populations and/or Communities Subject to the 'Test of Significance'**

| | |
|---|---|
| **Ecological Communities** | N/A |
| **Populations** | N/A |
| **Flora** | N/A |
| **Fauna** | Grey-headed Flying-fox (*Pteropus poliocephalus*) |

## 6.1 Significant impact criteria in accordance with the BC Act 2016

As previously stated within Section 2.8, local development proposals that do not exceed the Biodiversity Offset Threshold are still required to carry out a 'test of significance'.

(1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

*FAUNA – GREY-HEADED FLYING FOX*

a. ***in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*** The National Parks and Wildlife Service (NPWS) describe a local population as one *"that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary of the study area can be demonstrated."*

DECC (2007) & DPI (2008) further expands the local population definition to include:

- The *local population* of a threatened *plant* species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.

- The *local population* of *resident fauna* species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.

- The *local population* of *migratory or nomadic fauna* species comprises those individuals that are likely to occur in the study area from time to time.

DECC (2007) & DPI (2008) further states that the key assessment for this component is the "risk of extinction of the local population. The risk of extinction will increase if any factor operates to reduce population size or reproduction success." It is further noted that any known or presumed local population should be assumed to be viable for the purpose of this assessment unless otherwise proven.

**Megachiropterans (Grey-headed Flying-fox)**

*Local Population*

As the noted mega-bat species is wide ranging in the region, it is considered that they are not genetically isolated on the subject site and form part of populations within the wider region.

Grey-headed Flying Fox (*Pteropus poliocephalus*)

The species was recorded flying over the study area during the dusk avifauna survey. The Bionet database contains six (6) records of this species within 10 kilometres from the centre of the site.

*Stages of lifecycle potentially affected by development*

| Species | Habitat Preference | Roosting/Breeding |
|---|---|---|
| Grey-headed Flying-fox | The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c).<br>During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species is a canopy-feeding frugivore, blossom- | This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001).<br>"Roosting habitat critical to survival: Grey-headed Flying-foxes roost in large aggregations in the exposed branches of canopy trees (Ratcliffe 1931, Nelson 1965a, Parry-Jones and Augee 1992). The locations of camps are generally stable through time, and several sites have documented histories that exceed 100 |

| Species | Habitat Preference | Roosting/Breeding |
|---|---|---|
| | eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000). | years (Lunney and Moon 1997). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001).<br>On the basis of current knowledge, roosting habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for Grey-headed Flying-foxes. Roosting habitat that:<br>1. is used as a camp either continuously or seasonally in > 50% of years<br>2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 10 000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months)<br>3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May) (in DECCW, 2009) |

The majority of the proposal footprint seeks to utilise existing roads and cleared/modified areas. As previously discussed, the majority of the works footprint is heavily infested with exotic species with the occasional residual native tree occurring.

The proposal seeks to remove twelve trees which may provide potential foraging resources for the species.

The species is capable of travelling long distances in search of food, and similar type of foraging material are abundant within the locality (Remaining forested areas of the site, Mebbin National Park, private properties etc.).

Reviewing the above, it is considered that the removal of twelve (12) trees is negligible for the species given the abundance of available foraging resources within the region.

No roosting sites occurs within, or within close proximity to the site with the nearest camp occurring ~11km northeast of the subject site within Uki (DoEE, 2019).

*Likelihood of Local Extinction*

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the discussed megabat to the point that they are at risk of extinction.

***b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:***

i. ***is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***

ii. ***is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,***

N/A for threatened fauna.

c. ***in relation to the habitat of a threatened species or ecological community:***

**i.** ***the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,***

Twelve (12) trees which may provide foraging material for the species are proposed for removal. It is noted that the majority of these are regrowth (<8m in height). Trees required to be removed occur as isolated trees occurring within modified areas or along the edge of bushland.

All forested areas of the site are considered to provide potential foraging material for the Grey-headed Flying Fox, although similar type flowering and fruiting species are abundant within the locality. No roosting sites occur within, or within close proximity to the works footprint.

These areas (to be modified) are not considered to represent a 'significant area of habitat' for the recorded, or potentially occurring threatened species.

Reviewing the above, it is considered that the proposed development will not result in the removal or modification of a significant area of habitat for threatened fauna species.

**ii.** ***whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and***

**iii.** ***the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,***

In assessing the potential for habitats of threatened species, populations or ecological communities to become fragmented or isolated to such an extent that the long-term survival of the said species, population or community is at risk, the following is to be considered:

- 'Interconnecting or proximate areas of habitat' (which may be at risk of being fragmented or isolated from other habitat areas) are considered to be two or more habitat areas where currently an individual can move between the two. Such areas could become 'isolated' in the event that the development negates future potential movement of individuals between the two habitats. This could occur through the clearance of habitat, creation of physical impediments (i.e. roads, fences) or potential impacts to behaviour (fauna) which may restrict future movements.

- For threatened species, in reviewing whether isolation may occur, consideration must be given to the movement values of the site and surrounds for particular species, the mobility of threatened species, connectivity of habitats within and external to the site and the degree to which the proposal may significantly disrupt these patterns.

- Consideration should be given to the dispersal and genetic exchange mechanisms of individual species and whether the isolation of currently interconnecting or proximate areas of habitat for threatened species, communities or populations will adversely affect the maintenance of gene flow and the ability to sustain viable populations (DEC, 2005).

As discussed, it is considered that the works are of a minor nature and are therefore unlikely to significantly affect the dispersal function of any terrestrial corridors or key habitats.

The works footprint does not occur within a mapped 'regional' or 'subregional' corridor.

The proposed works will not contribute to further fragmentation or isolation of habitat occurring within the locality. The works footprint is small and utilises existing roads and cleared/modified areas.

Large-scale local fauna movement occurs in association with the forested areas along Tweed River which connects to expansive areas of bushland and other protected areas of the locality (i.e. Mebbin National Park, Nightcap National Park, Border Ranges National Park, Wollumbin National Park etc.). It is considered that this corridor is sufficient in size to retain fauna movement opportunities between local habitats.

Reviewing the above, it is considered that the proposal will not result in a significant area of habitat for a threatened species or populations to become isolated from currently interconnecting or proximate areas of habitat for threatened species, populations or ecological communities. Further the proposal is unlikely to adversely impact upon or alienate movement corridors or limit dispersal options for any threatened species.

### d. *whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),*

N/A. No areas of outstanding biodiversity value occur within proximity to the proposal site.

### e. *whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

The *Biodiversity Conservation Act 2016* defines a 'threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities.' Accordingly, Key Threatening Processes are nominated within Schedule 4 of the Act and include the following (online @ https://www.legislation.nsw.gov.au/#/view/act/2016/63/sch4):

**Table 7: BCA Key Threatening Processes**

| THREATENING PROCESS | COMMENT |
|---|---|
| Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, *Manorina melanocephala* | Not applicable |
| Alteration of habitat following subsidence due to longwall mining | Not applicable |
| Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands | Not applicable |
| Anthropogenic climate change | Not applicable |
| Bushrock removal | Not applicable |
| Clearing of native vegetation | The proposed works will involve clearing of some native vegetation (including clearing of one or more strata within a stand of native vegetation). The NSW Scientific Committee notes in their final determination that 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biological diversity and includes impacts such as the following: |

| | |
|---|---|
| | • Destruction of habitat results in loss of local populations of individual species<br>• Fragmentation<br>• Expansion of dryland salinity<br>• Riparian zone degradation<br>• Increased greenhouse gas emissions<br>• Increased habitat for invasive species<br>• Loss of leaf litter layer<br>• Loss or disruption of ecological function<br>• Changes to soil biota (NSW Scientific Committee, 2001)<br>However, a review of this report notes that clearance will primarily occur in an area which has already been cleared/modified with residual native vegetation and regrowth also proposed to be removed.<br>It is considered that the level of clearing proposed is unlikely to significantly impact upon the viability of threatened fauna species and habitat values available within the site and surrounding locality. |
| Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*) | Not applicable |
| Competition and habitat degradation by feral goats (*Capra hircus*) | Not applicable |
| Competition from feral honey bees (*Apis mellifera*) | Not applicable |
| Death or injury to marine species following capture in shark control programs on ocean beaches | Not applicable |
| Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments | Not applicable. |
| Forest Eucalypt dieback associated with over-abundant psyllids and bell miners | Not applicable |
| High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition | Not applicable |
| Herbivory and environmental degradation caused by feral deer | Not applicable |
| Importation of red imported fire ants (*Solenopsis invicta*) | Not applicable |
| Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations | Not applicable |
| Infection of frogs by amphibian chytrid causing the disease chytridiomycosis | Not applicable |
| Infection of native plants by *Phytophthora cinnamomi* | Not applicable |
| Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae | Not applicable |
| Introduction of the large earth bumblebee (*Bombus terrestris*) | Not applicable |
| Invasion and establishment of exotic vines and scramblers | Several exotic vines were recorded onsite. These species should be removed in association with the proposal where they occur within the work zone. |
| Invasion and establishment of Scotch broom (*Cytisus scoparius*) | Not applicable |

| | |
|---|---|
| Invasion and establishment of the cane toad (*Bufo marinus*) | The cane toad was recorded onsite during survey works. The proposal is unlikely to increase the impacts of this listed threatening process. |
| Invasion of native plant communities by African Olive *Olea europaea* L. subsp. *cuspidata* | Not applicable |
| Invasion, establishment and spread of *Lantana camara* | Lantana was recorded on site. The species should be removed in association with the proposal where it occurs within the works zone. |
| Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed) | Not applicable |
| Invasion of native plant communities by exotic perennial grasses | Several exotic grass species were recorded on site, in particularly within the drainage line. These should be removed in association with the proposal where it occurs within the works zone. |
| Invasion of the yellow crazy ant (*Anoplolepis gracilipes* (Fr. Smith)) into NSW | Not applicable |
| Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants | Not applicable |
| Loss of hollow-bearing trees | Not applicable |
| Loss or degradation (or both) of sites used for hill-topping by butterflies | Not applicable |
| Predation and hybridisation of feral dogs (*Canis lupus familiaris*) | Dogs are well known from the locality. The proposal is unlikely to increase the impacts of this listed threatening process. |
| Predation by the European red fox (*Vulpes vulpes*) | Not applicable |
| Predation by the feral cat (*Felis catus*) | Cats are well known within the locality. The proposal is unlikely to increase the impacts of this listed threatening process. |
| Predation by *Gambusia holbrooki* Girard, 1859 (plague minnow or mosquito fish) | Not applicable |
| Predation by the ship rat (*Rattus rattus*) on Lord Howe Island | Not applicable |
| Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) | Not applicable |
| Removal of dead wood and dead trees | Not applicable |

Reviewing the above, it is considered that the proposed works will not have any significant impacts in accordance with the 'test of significance'.

A Species Impact Statement (SIS) would not be required for the proposal.

## 6.2 SEPP 44 Koala Habitat Assessments

In February 1995 the NSW Department of Infrastructure, Planning and Natural Resources enacted the *State Environmental Planning Policy No. 44: Koala Habitat Protection*. This Policy 'aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.'

In association with development applications and in areas where the policy applies a number of criteria are to be addressed to determine levels of assessment and to govern management considerations. The steps are as follows:

1. *Does the Policy Apply?*

Is the land greater than 1ha in size and located within one of the Local Government areas listed within Schedule 1 of SEPP 44?

Yes. The land is greater than 1ha and occurs within the Tweed Shire Government Area.

2. *Is the land potential koala habitat?*

The SEPP defines 'potential koala habitat' as 'areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.' The trees within Schedule 2 are tabulated below:

**Table 8: SEPP 44 Koala Feed Trees**

| Scientific Name | Common Name |
|---|---|
| *Eucalyptus tereticornis* | Forest red gum |
| *Eucalyptus microcorys* | Tallowwood |
| *Eucalyptus punctata* | Grey Gum |
| *Eucalyptus viminalis* | Ribbon or manna gum |
| *Eucalyptus camaldulensis* | River red gum |
| *Eucalyptus haemastoma* | Broad leaved scribbly gum |
| *Eucalyptus signata* | Scribbly gum |
| *Eucalyptus albens* | White box |
| *Eucalyptus populnea* | Bimble box or poplar box |
| *Eucalyptus robusta* | Swamp mahogany |

None of the above trees occur within the works footprint. As such it is considered that the land does not represent 'potential koala habitat' as defined under SEPP 44.

3. *Is the land core koala habitat?*

The SEPP defines 'core koala habitat' means 'an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.'

No koala habitat occurs within the works footprint and as such it is considered that the proposal with respect to its definition under SEPP 44 is not located within land that is 'core koala habitat'.

4. *Is there a requirement to prepare a Plan of Management for land containing core koala habitat?*

No. It is considered that the site does not contain core Koala habitat as described. A Koala Plan of Management (KPoM) is not required for the proposal.

# 7 SITE IMPACTS

This section of the report reviews the proposal and likely resultant impact to flora, fauna and habitat value.

## 7.1 Significance of Impacts to Threatened Species and/or Communities

DEC (2005 & 2008) outline assessments relating to the significance of impacts of actions to threatened species, communities and populations. DEC (2005) notes that evaluation of impacts should involve not only the magnitude and extent of impacts, but also the significance of the impacts as related to the conservation importance of the habitat, individuals and populations likely to be affected.

Impacts are considered more significant if:
- Areas of high conservation value are affected.
- Individual animals and/or plants and/or subpopulations that are likely to be affected by a proposal play an important role in maintaining the long-term viability of the species, population or ecological community.
- Habitat features that are likely to be affected by a proposal play an important role in maintaining the long-term viability of the species, population or ecological community.
- The impacts are likely to be long-term in duration.
- The impacts are likely to be permanent and irreversible.

The proposal footprint is ~0.6ha and primarily utilises existing roads and already cleared/modified areas which are dominated by weeds. Given the small scale of vegetation removal required and the abundance of available habitat within the locality, it is considered that impacts associated with the proposal is insignificant.

Consequently, no threatened flora or fauna or EECs are expected to be impacted upon as a result of the works. Additionally, no endangered populations or AOBVs occur on site.

As such, no impacts are expected to occur upon the site's EEC or threatened species.

| | |
|---|---|
| *Largely Disturbed/Modified Areas Utilised* | *Largely Disturbed/Modified Areas Utilised* |

*Existing Roads to be Utilised*

*Existing Roads to be Utilised*

## 7.2 Impacts to Vegetation

Clearing of vegetation (both native and exotic) will be the major direct impact associated with the intended works although this clearing will be restricted to largely modified areas with the occasional native tree.

In order to facilitate works required for the proposal, twelve (12) trees (11 native and 1 exotic) are required to be removed. It is noted that the majority of these trees are juveniles (<8m in height) and likely have regenerated within the last 10 years. The works/clearing envelope is approximately 0.6ha. It is noted that the majority of this area comprises of existing roads and modified/disturbed areas dominated by weeds.

A vegetation clearing plan has been prepared for the proposed private road works (refer to **Figure 12**).

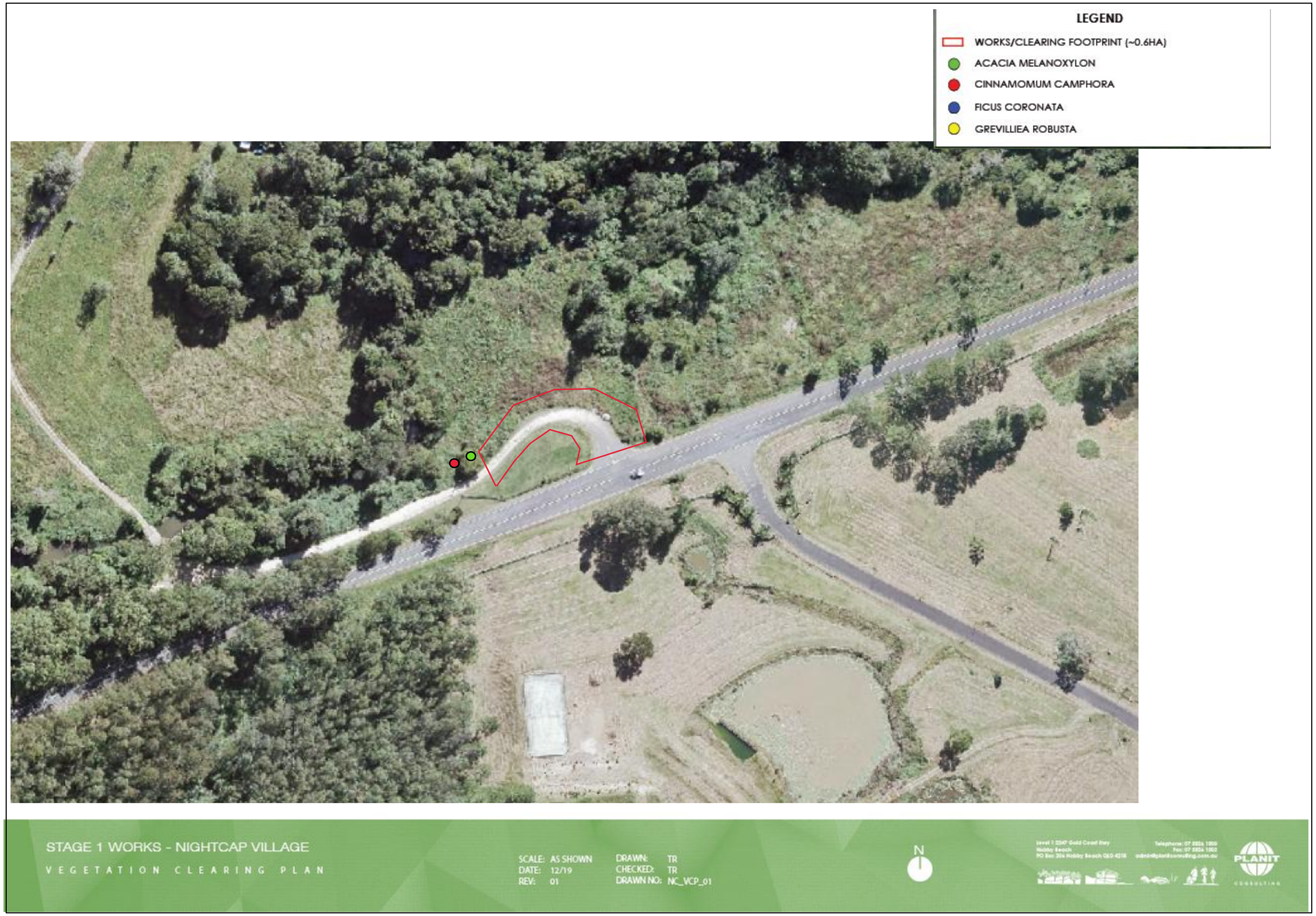

LEGEND
WORKS/CLEARING FOOTPRINT (~0.6HA)
ACACIA MELANOXYLON
CINNAMOMUM CAMPHORA
FICUS CORONATA
GREVILLIEA ROBUSTA
STAGE 1 WORKS - NIGHTCAP VILLAGE
VEGETATION CLEARING PLAN
SCALE: AS SHOWN
DATE: 12/19
REV: 01
DRAWN: TR
CHECKED: TR
DRAWN NO: NC_VCP_01
N
PLANIT

Figure 12: Vegetation Clearing Plan

## 7.3 Impacts to Fauna Habitat

Typical additional impacts associated with development on fauna and associated habitat include:

- Overall loss of standing biomass and reduction in flora species abundance/diversity
- Mortality as a result of construction activities (removal/disturbance of nests, hollows, burrows and general habitat)
- Loss of habitat complexity from the clearance zones including loss of potential foraging and nesting/roosting resources
- Increased potential from 'edge effects' to retained remnants (on or offsite)
- Disturbance of species behaviour (i.e. some species are less tolerant to human presence or a higher level of human activity and may abandon currently utilized habitats)
- Reduction of potential fauna movement linkages throughout the overall landscape
- Alteration to the fauna assemblage (some species tolerant to modified habitats (i.e. rats, minors, crows etc.) may dominant the newly created niches and displace species from adjacent vegetated remnants)

In this instance, it is considered that only a minor loss of native foraging resources, potential refuge habitat and potential nesting/breeding sites will occur as the development will be restricted to a relatively small area of disturbed, largely non-native vegetation and no hollow bearing trees will be removed.

It is also considered that a significant increase in 'edge effects' (and potential associated behavioural alteration through the establishment of a new edge) or significant reduction of terrestrial fauna movement through the landscape is unlikely to occur given the small scale of the proposal which utilises existing roads and modified/disturbed areas.

# 8 MEASURES TO AVOID AND MINIMISE ECOLOGICAL IMPACTS

## 8.1 Protection and Avoidance

Reviewing the ecological integrity of vegetation associations and fauna habitat present on the site, the proposal is unlikely to impose a significant impact on the environmental values of the locality. No significant habitats, poorly conserved ecosystems, significant flora species or significant fauna species (or associated important habitat) were recorded onsite which would warrant redesign of the proposal to include covenants or parkland for ecological protection purposes.

## 8.2 Mitigation Measures

The following measures are proposed to mitigate potential impacts associated with the proposed private road works:

### 8.2.1 Impact of Vegetation and Habitat Clearing

Retained native vegetation (individual trees and copses of vegetation) proximate to works which are not subject for removal are to be clearly managed during construction activities generally in accordance with the *Australian Standard 'AS 4970 Protection of Trees on Development Sites'* to avoid any potential impacts.

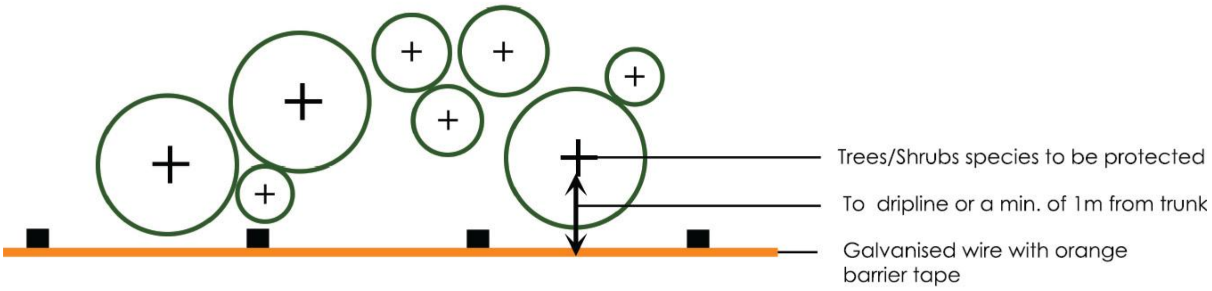
Within the retention zone tree management is to occur as follows:

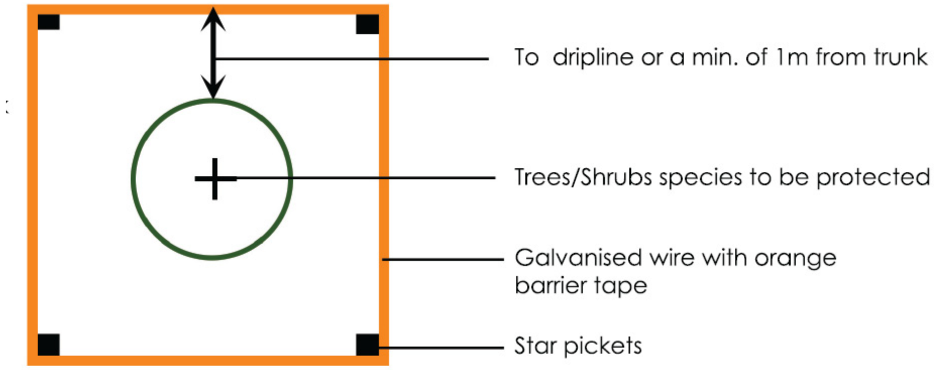
- Retained native vegetation (trees and copses of vegetation) proximate to earthworks are to be clearly fenced and managed during construction activities and through the establishment and maintenance periods in accordance with the Vegetation Management Plan and Australian Standard AS 4970 Protection of trees on development sites to avoid any of the following:

Structural damage to the tree including root damage;

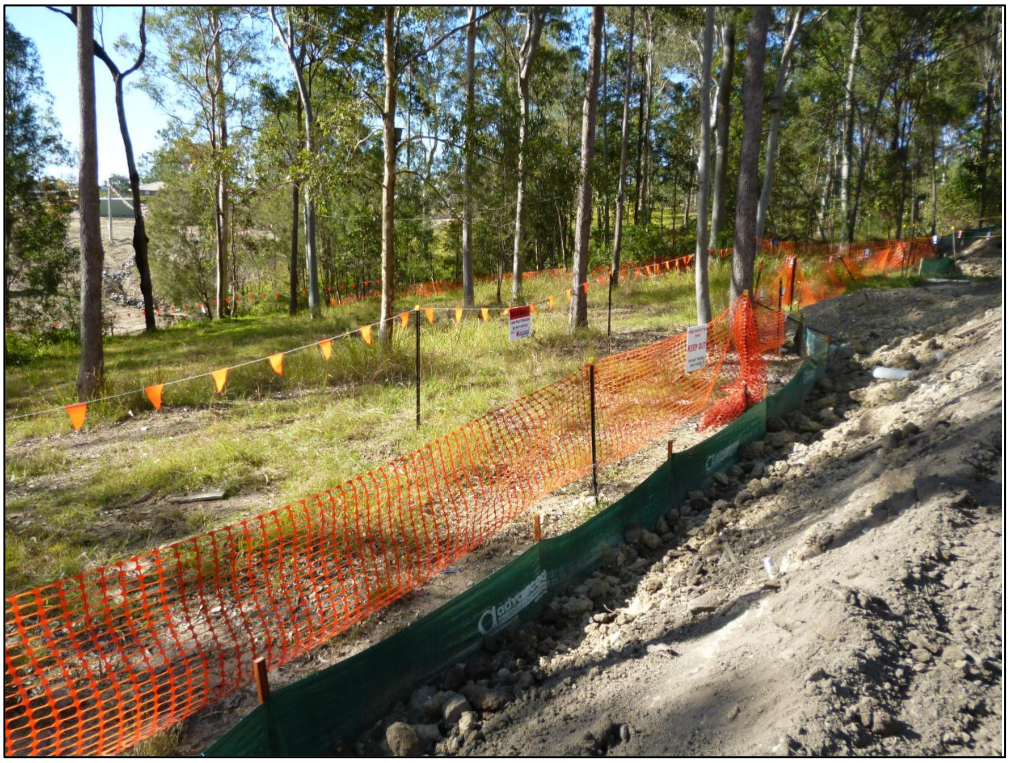
- Compaction of the root plate including parking of any vehicles;
- Filling of soil within the tree protection zone (tpz) and/or drip zone; and
- Storage of any building materials within the drip zone;
- Long-term harm to the health of the tree.

VEGETATION GROUP TO BE PROTECTED


Trees/Shrubs species to be protected
To dripline or a min. of 1m from trunk
Galvanised wire with orange barrier tape


To dripline or a min. of 1m from trunk
Trees/Shrubs species to be protected
Galvanised wire with orange barrier tape
Star pickets

INDIVIDUAL TREE TO BE PROTECTED



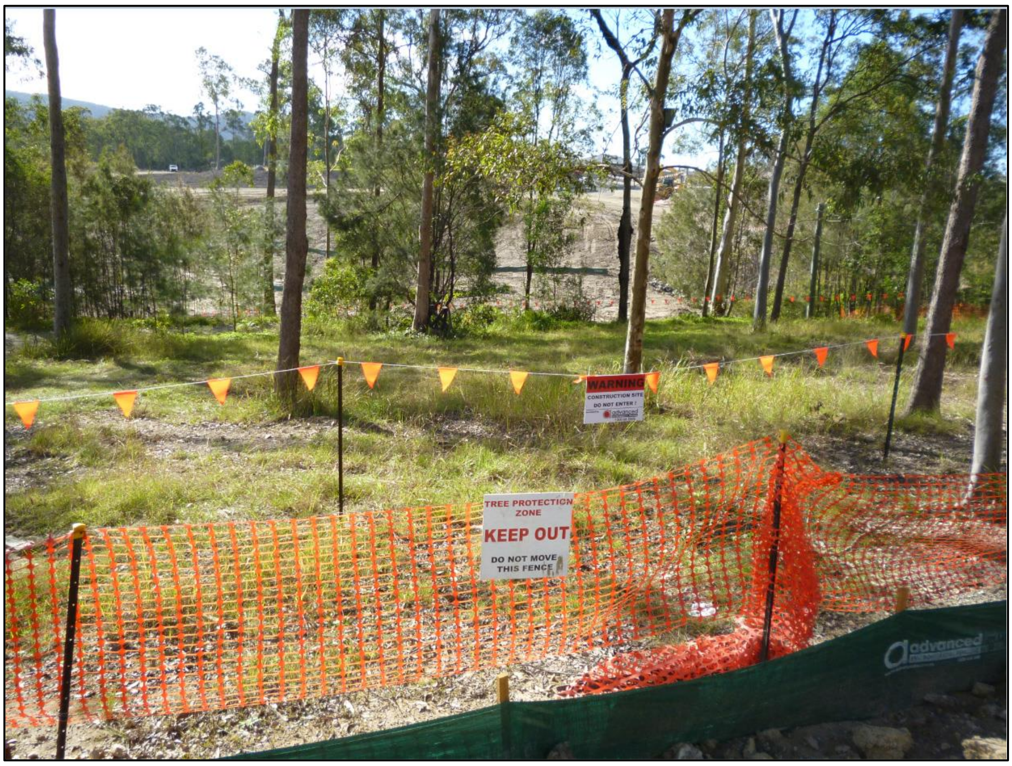

WARNING
CONSTRUCTION SITE
DO NOT ENTER
TREE PROTECTION ZONE
KEEP OUT
DO NOT MOVE THIS FENCE
advanced

**Figure 13: Examples of Retained Interface Exclusion Fencing**

Within the designated clearance zone identification of areas to be cleared are to be pre-assessed by an experienced wildlife spotter/catcher. This pre-assessment shall allow for an inventory of trees bearing birds nests and/or hollows (if applicable) to be undertaken prior to felling works [none noted during ecological assessment]. A wildlife spotter catcher is to be utilized during clearing of the site to ensure safe dispersal and relocation of any encountered native fauna within the property.

A Vegetation Management Plan for the construction and vegetation clearing phase of the proposal is to be provided within the CEMP for the proposal.

### 8.2.2 Offsets and Compensatory Works

No offsets are triggered in accordance with the Biodiversity Offsets Scheme.

No nest boxes are required to be installed as no hollow-bearing trees will be removed as a part of the proposal.

# Appendix 1 – Proposal Plans

N
TWEED RIVER
LOT 11
DP 1194471
CARRIAGEWAY WIDENING ON BEND TO ACCOMMODATE 12.5m HRV VEHICLE
EXTEND EXISTING Ø375 RCP CULVERT AT BOTH UPSTREAM AND DOWNSTREAM ENDS WITH NEW HEADWALLS
EXISTING BRIDGE TO BE UPGRADED AS PART OF FUTURE WORKS
LIMIT OF WORKS. TIE IN NEATLY TO EXISTING GRAVEL ROAD
LIMIT OF WORKS
CH 0
CH 20
CH 40
CH 60
CH 80
CH 100
CH 105.051
KYOGLE ROAD
MEBBIN DRIVE
SW
100mm AT ORIGINAL SIZE

## LEGEND

| | |
|---|---|
| ▬ | SITE BOUNDARY |
| — | LOT BOUNDARY |
| — — | EASEMENT |
| - - - | EXISTING SURFACE CONTOURS MINOR (0.2m) |
| —— 80 —— | EXISTING SURFACE CONTOURS MAJOR (1.0m) |
| - - - | DESIGN SURFACE CONTOURS MINOR (0.2m) |
| —— 80 —— | DESIGN SURFACE CONTOURS MAJOR (1.0m) |
| 🟦 | SEALED PRIVATE ROAD |

**NOT FOR CONSTRUCTION**

| REV | DESCRIPTION | DATE | DRAWN | DESIGN | CHECK | APPROVED |
|---|---|---|---|---|---|---|
| A | FOR APPROVAL | 10/02/20 | BT | BT | AW | AW |
| B | FOR APPROVAL | 10/12/20 | BT | BT | AW | AW |

SCALES:
0 5 10 20 30
Full Size 1:500 ; Half Size 1:1000
Scale (m)

DO NOT SCALE FROM DRAWING

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DRAWN BY:
DESIGN BY:
APPROVED BY:
DATE:
THIS DRAWING MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

PLANIT CONSULTING
LEVEL 2, 11-13 PEARL STREET
PO BOX 1623
KINGSCLIFF NSW 2487

TELEPHONE: 02 6674 5001
ABN: 20 099 261 711
EMAIL: administration@planitconsulting.com.au

CLIENT:
NCV ENTERPRISES PTY LTD

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
NIGHTCAP VILLAGE

DRAWING TITLE:
STAGE 01
ROAD PLAN

| ORIGINAL SIZE: | PLANIT JOB No.: | DRAWING No.: | REV: |
|---|---|---|---|
| A1 | J6100 | 1300 | B |

CAD FILE: T:\J6100 - NIGHTCAP DEVELOPMENT\6 - CAD\1300 ROAD PLAN.DWG PLOTTED BY: BRENDANT PLOT DATE: 10/12/2020 10:58:24 AM

# Appendix 2 – NSW Bionet Database Records (2019)

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) Entities in selected area [North: -28.43 West: 153.19 East: 153.29 South: -28.53] returned a total of 321 records of 54 species.

Report generated on 3/12/2019 11:04 AM

| Kingdom | Class | Family | Species Code | Scientific Name | Exotic | Common Name | NSW status | Comm. status | Records | Info |
|---|---|---|---|---|---|---|---|---|---|---|
| Animalia | Amphibia | Myobatrachidae | 3007 | *Assa darlingtoni* | | Pouched Frog | V,P | | 8 | i |
| Animalia | Amphibia | Myobatrachidae | 3075 | *^Mixophyes iteratus* | | Giant Barred Frog | E1,P,2 | E | 28 | i |
| Animalia | Amphibia | Hylidae | 3169 | *Litoria brevipalmata* | | Green-thighed Frog | V,P | | 1 | i |
| Animalia | Reptilia | Elapidae | 2677 | *Hoplocephalus stephensii* | | Stephens' Banded Snake | V,P | | 1 | i |
| Animalia | Aves | Columbidae | 0025 | *Ptilinopus magnificus* | | Wompoo Fruit-Dove | V,P | | 27 | i |
| Animalia | Aves | Columbidae | 0021 | *Ptilinopus regina* | | Rose-crowned Fruit-Dove | V,P | | 11 | i |
| Animalia | Aves | Podargidae | 0314 | *Podargus ocellatus* | | Marbled Frogmouth | V,P | | 9 | i |
| Animalia | Aves | Cacatuidae | 0265 | *^Calyptorhynchus lathami* | | Glossy Black-Cockatoo | V,P,2 | | 4 | i |
| Animalia | Aves | Psittacidae | 0260 | *Glossopsitta pusilla* | | Little Lorikeet | V,P | | 2 | i |
| Animalia | Aves | Strigidae | 0246 | *^^Ninox connivens* | | Barking Owl | V,P,3 | | 3 | i |
| Animalia | Aves | Strigidae | 0248 | *^^Ninox strenua* | | Powerful Owl | V,P,3 | | 4 | i |
| Animalia | Aves | Tytonidae | 0250 | *^^Tyto novaehollandiae* | | Masked Owl | V,P,3 | | 1 | i |

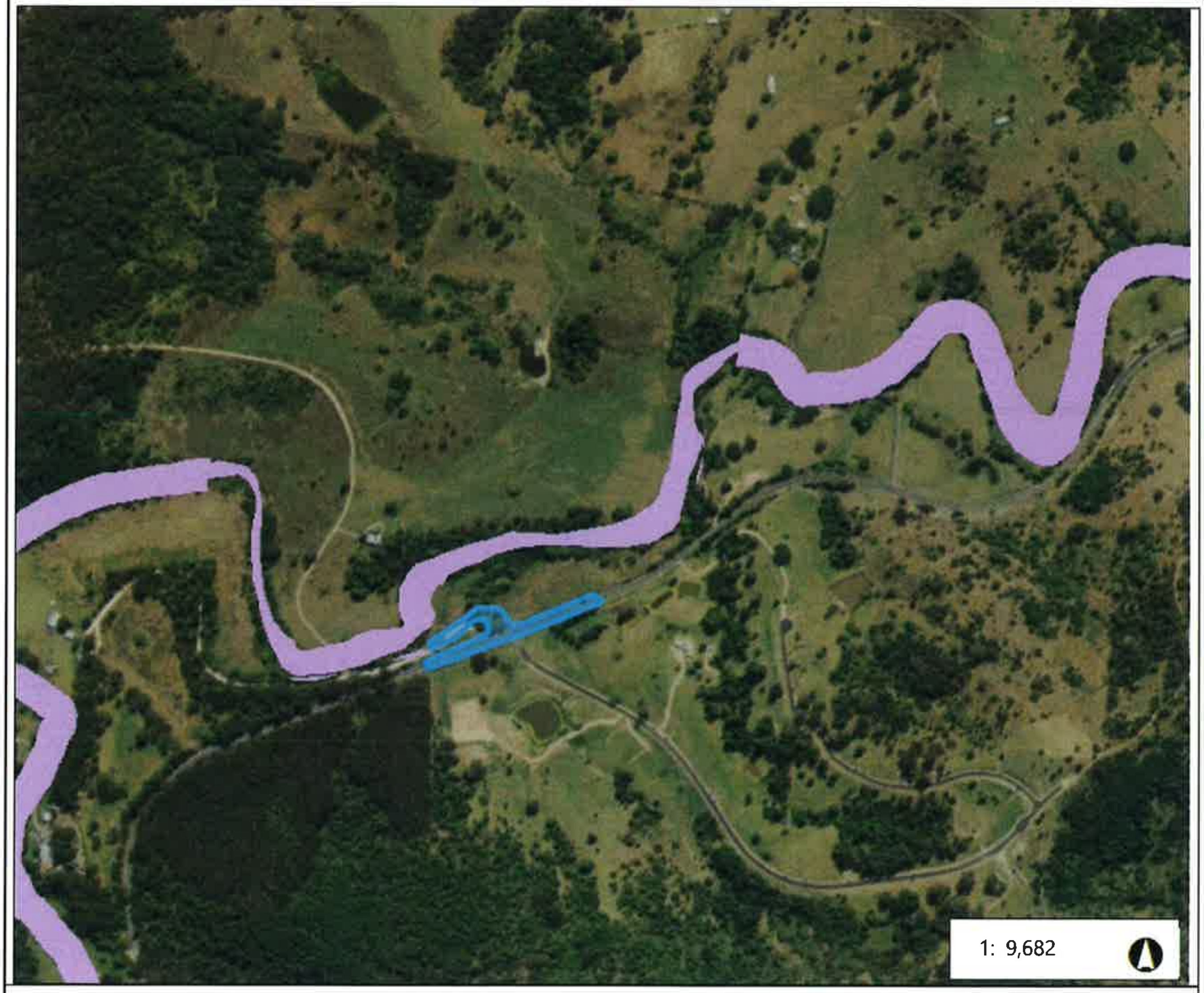
|  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|
| Animalia | Aves | Tytonidae | 9924 | *^^Tyto tenebricosa* | Sooty Owl | V,P,3 |  | 11 | ℹ |
| Animalia | Aves | Menuridae | 0351 | *Menura alberti* | Albert's Lyrebird | V,P |  | 4 | ℹ |
| Animalia | Aves | Dasyornithidae | 0519 | *^Dasyornis brachypterus* | Eastern Bristlebird | E1,P,2 | E | 1 | ℹ |
| Animalia | Aves | Pomatostomidae | 8388 | *Pomatostomus temporalis temporalis* | Grey-crowned Babbler (eastern subspecies) | V,P |  | 1 | ℹ |
| Animalia | Aves | Campephagidae | 0428 | *Coracina lineata* | Barred Cuckoo-shrike | V,P |  | 3 | ℹ |
| Animalia | Aves | Monarchidae | 0376 | *Carterornis leucotis* | White-eared Monarch | V,P |  | 15 | ℹ |
| Animalia | Aves | Petroicidae | 0380 | *Petroica boodang* | Scarlet Robin | V,P |  | 4 | ℹ |
| Animalia | Mammalia | Dasyuridae | 1008 | *Dasyurus maculatus* | Spotted-tailed Quoll | V,P | E | 2 | ℹ |
| Animalia | Mammalia | Dasyuridae | 1045 | *Planigale maculata* | Common Planigale | V,P |  | 1 | ℹ |
| Animalia | Mammalia | Phascolarctidae | 1162 | *Phascolarctos cinereus* | Koala | V,P | V | 80 |  |
| Animalia | Mammalia | Petauridae | 1136 | *Petaurus australis* | Yellow-bellied Glider | V,P |  | 2 | ℹ |
| Animalia | Mammalia | Petauridae | 1137 | *Petaurus norfolcensis* | Squirrel Glider | V,P |  | 1 | ℹ |
| Animalia | Mammalia | Macropodidae | 1215 | *Petrogale penicillata* | Brush-tailed Rock-wallaby | E1,P | V | 1 |  |
| Animalia | Mammalia | Macropodidae | 1234 | *Thylogale stigmatica* | Red-legged Pademelon | V,P |  | 11 | ℹ |
| Animalia | Mammalia | Pteropodidae | 1280 | *Pteropus poliocephalus* | Grey-headed Flying-fox | V,P | V | 6 | ℹ |
| Animalia | Mammalia | Molossidae | 1329 | *Micronomus norfolkensis* | Eastern Coastal Free-tailed Bat | V,P |  | 2 | ℹ |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Animalia | Mammalia | Vespertilionidae | 1353 | *Chalinolobus dwyeri* | Large-eared Pied Bat | V,P | V | 1 | ℹ |
| Animalia | Mammalia | Vespertilionidae | 1354 | *Chalinolobus nigrogriseus* | Hoary Wattled Bat | V,P | | 1 | ℹ |
| Animalia | Mammalia | Vespertilionidae | 1357 | *Myotis macropus* | Southern Myotis | V,P | | 5 | ℹ |
| Animalia | Mammalia | Vespertilionidae | 1336 | *Nyctophilus bifax* | Eastern Long-eared Bat | V,P | | 3 | ℹ |
| Animalia | Mammalia | Vespertilionidae | 1361 | *Scoteanax rueppellii* | Greater Broad-nosed Bat | V,P | | 1 | ℹ |
| Animalia | Mammalia | Vespertilionidae | 1025 | *Vespadelus troughtoni* | Eastern Cave Bat | V,P | | 1 | ℹ |
| Animalia | Insecta | Noctuidae | I021 | *Phyllodes imperialis southern subspecies* | Southern Pink Underwing Moth | E1 | E | 2 | ℹ |
| Plantae | Flora | Cunoniaceae | 10943 | *^Davidsonia jerseyana* | Davidson's Plum | E1,2 | E | 1 | ℹ |
| Plantae | Flora | Doryanthaceae | 1020 | *Doryanthes palmeri* | Giant Spear Lily | V,P | | 5 | ℹ |
| Plantae | Flora | Euphorbiaceae | 8333 | *Fontainea australis* | Southern Fontainea | V | V | 1 | ℹ |
| Plantae | Flora | Fabaceae (Faboideae) | 2833 | *Desmodium acanthocladum* | Thorny Pea | V | V | 4 | ℹ |
| Plantae | Flora | Lauraceae | 3491 | *Endiandra hayesii* | Rusty Rose Walnut | V | V | 7 | ℹ |
| Plantae | Flora | Lauraceae | 8480 | *Endiandra muelleri subsp. bracteata* | Green-leaved Rose Walnut | E1 | | 8 | ℹ |
| Plantae | Flora | Meliaceae | 3682 | *Owenia cepiodora* | Onion Cedar | V | V | 5 | ℹ |
| Plantae | Flora | Myrtaceae | 11894 | *Gossia fragrantissima* | Sweet Myrtle | E1 | E | 1 | ℹ |
| Plantae | Flora | Myrtaceae | 4283 | *Rhodamnia rubescens* | Scrub Turpentine | E4A | | 6 | ℹ |

|  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|
| Plantae | Flora | Myrtaceae | 4284 | *Rhodomyrtus psidioides* | Native Guava | E4A |  | 1 |  |
| Plantae | Flora | Orchidaceae | 4479 | *^Peristeranthus hillii* | Brown Fairy-chain Orchid | V,P,2 |  | 1 | ℹ |
| Plantae | Flora | Orchidaceae | 4584 | *^Sarcochilus hartmannii* | Hartman's Sarcochilus | V,P,2 | V | 7 | ℹ |
| Plantae | Flora | Poaceae | 4776 | *Arthraxon hispidus* | Hairy Jointgrass | V | V | 1 | ℹ |
| Plantae | Flora | Proteaceae | 5354 | *Floydia praealta* | Ball Nut | V | V | 2 | ℹ |
| Plantae | Flora | Proteaceae | 5446 | *Macadamia tetraphylla* | Rough-shelled Bush Nut | V | V | 4 | ℹ |
| Plantae | Flora | Rhamnaceae | 5586 | *Pomaderris notata* | McPherson Range Pomaderris | V |  | 2 | ℹ |
| Plantae | Flora | Rutaceae | 9487 | *Zieria adenodonta* | Wollumbin Zieria | E1 |  | 1 | ℹ |
| Animalia | Mammalia | Miniopteridae | 1346 | *Miniopterus australis* | Little Bent-winged Bat | V,P |  | 5 | ℹ |
| Animalia | Mammalia | Miniopteridae | 3330 | *Miniopterus orianae oceanensis* | Large Bent-winged Bat | V |  | 1 | ℹ |

# Appendix 3 - BOSET Report Prepared for the Site

# Biodiversity Offset Scheme (BOS) Entry Threshold Map



491.8 0 245.91 491.8 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Legend

🟪 Biodiversity Values that have been mapped for more than 90 days

🟪 Biodiversity Values added within last 90 days

Notes

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NSW Environment & Heritage

NSW
GOVERNMENT

# Biodiversity Values Map and Threshold Report

**Results Summary**

| | | |
|---|---|---|
| **Date of Calculation** | 10/12/2019 12:51 PM | **BDAR Required*** |
| **Total Digitised Area** | 0.56 ha | |
| **Minimum Lot Size Method** | LEP | |
| **Minimum Lot Size** | 0.04 ha | |
| **Area Clearing Threshold** | 0.25 ha | |
| **Area clearing trigger**<br>Area of native vegetation cleared | Unknown # | Unknown # |
| **Biodiversity values map trigger**<br>Impact on biodiversity values map(not including values added within the last 90 days)? | no | no |
| **Date of the 90 day Expiry** | N/A | |

*If BDAR required has:

- at least one 'Yes': you have exceeded the BOS threshold. You are now required to submit a Biodiversity Development Assessment Report with your development application. Go to https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor to access a list of assessors who are accredited to apply the Biodiversity Assessment Method and write a Biodiversity Development Assessment Report
- 'No': you have not exceeded the BOS threshold. You may still require a permit from local council. Review the development control plan and consult with council. You may still be required to assess whether the development is "likely to significantly affect threatened species' as determined under the test in s. 7.3 of the Biodiversity Conservation Act 2016. You may still be required to review the area where no vegetation mapping is available.

# Where the area of impact occurs on land with no vegetation mapping available, the tool cannot determine the area of native vegetation cleared and if this exceeds the Area Threshold. You will need to work out the area of native vegetation cleared - refer to the BOSET user guide for how to do this.

On and after the 90 day expiry date a BDAR will be required.

## Disclaimer

This results summary and map can be used as guidance material only. This results summary and map is not guaranteed to be free from error or omission. The State of NSW and Office of Environment and Heritage and its employees disclaim liability for any act done on the information in the results summary or map and any consequences of such acts or omissions. It remains the responsibility of the proponent to ensure that their development application complies will all aspects of the *Biodiversity Conservation Act 2016.*

The mapping provided in this tool has been done with the best available mapping and knowledge of species habitat requirements. This map is valid for a period of 30 days from the date of calculation (above).

## Acknowledgement

I as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature__________________ Date: 10/12/2019 12:51 PM